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PLASTICS

A Periodical Devoted to the Manufacture and Use of Composition Products

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Molded Products

See Page 483

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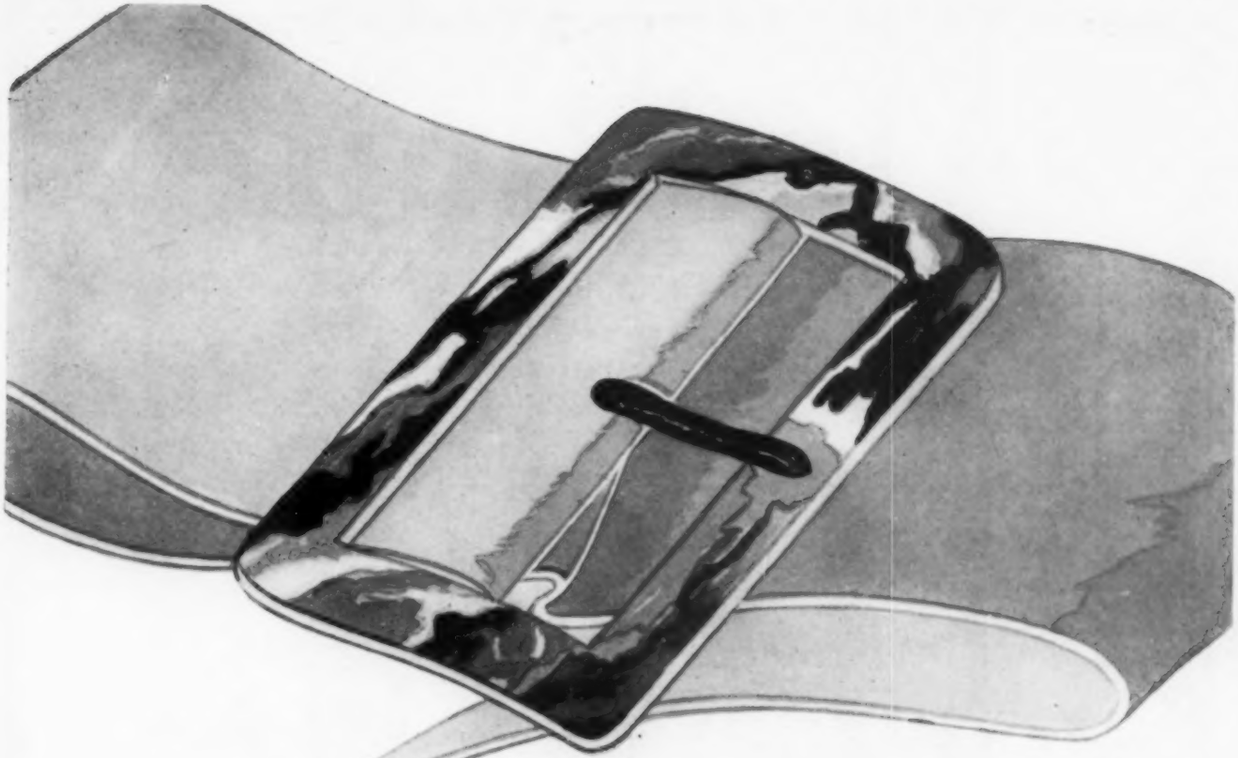

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PLASTICS
& MOLDED PRODUCTS

A periodical devoted to the manufacture and use of plastic and composition products

Vol. 3 SEPTEMBER, 1927 No. 9

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PLASTICS

A periodical devoted to the manufacture and use of plastic and composition products

Vol. 3 SEPTEMBER, 1927 No. 9

Molding Cellulose Acetate Articles

Choice of proper plasticizing agent allows use of molding methods analogous to those employed with resins

ALTHOUGH cellulose acetate has been known almost as long as cellulose nitrate or pyroxylin, and though some very excellent photographic films have been made from it, the use of this material for making molded objects has not enjoyed the popularity in America that it apparently has enjoyed in Europe, and in Germany in particular.

In the latter country cellulose acetate products, under the general trade-name of *Zellon* or *Cellone* have proven to be very successful. A few years ago cellulose acetate as a substitute for shellac in phonograph records had a fairly extended trial in the United States, the only difficulty found at that time having been a somewhat too low softening point.

Brittleness Overcome

One of the properties sometimes complained about in the case of cellulose acetate plastics has been their relative stiffness or brittleness, but recent developments and the discovery of suitable plasticizing agents seem to point the way to a more wide-spread use of the much less inflammable cellulose acetate plastics as a substitute for pyroxylin materials.

Although applied for in 1923, a patent only issued last August to Camille Dreyfus, assignor to the American Cellulose and Chemical Manufacturing Co., (U. S. P. 1,595,506) which covers the manufacture of pressed or molded articles from compositions containing cellulose derivatives, and especially such as are made from cellulose acetate.

*Dr. Camille Dreyfus, who, together with his brother, Dr. Henri Dreyfus, has patented a very large number of improvements in the cellulose acetate art, and whose research in this field has materially advanced our knowledge of the cellulose derivatives.**

The following description of the process is based in great part on the patent in question.

*Photo from Worden's Technology of Cellulose Esters, 1920.

The invention may be applied with particular advantage for the manufacture of phonograph records, electrical articles such as switchboards, distributor heads for motor car ignition systems, and so forth, but is also applicable for the manufacture of molded articles and objects in general.

It is particularly applicable for the production of pressed or molded articles having a basis of cellulose acetate, but cellulose esters of other organic acids, or cellulose ethers, or mixtures of any of such esters or ethers, may be employed wholly or partly instead of cellulose acetate.

Used as a Powder

The cellulose derivative, in particular cellulose acetate, is melted together with one or more plasticizing agents in a pot or in other suitable way, with or without addition of resin or resins for example acaroid resin, rosin, shellac, copal or other and with or without other desired additions, such for example as dyes, pigments, inflammability reducing agents, stabilizers, or in some cases filling materials, and after the melted mass has been allowed to solidify, preferably by running it into sheets, slabs or other convenient form, it is ground to powder, and the powder, either directly or after working up on heated rolls with or without

powdered filling materials, dyes, pigments, inflammability reducing agents, stabilizers or other desired additions, is pressed under heat in molds or matrices, or through dies, or on to or between carriers, backings or the like, or otherwise, to form articles or objects of any kind.

In the case of some desired additions, as for example dyes, inflammability reducing agents such as triphenyl or tricresyl phosphate, stabilizers such as alkyl or aryl urea derivatives, etc., these may be made to the cellulose derivative containing mixture before the melting, but in the case of additions such as filling materials, which are usually added in substantial proportions, these should preferably be incorporated or mainly incorporated after the melting and grinding.

Fillers Aid in Grinding

If the melted material is too soft to permit of easy grinding, pulverulent filling material may be added to it until a sample shows that it can be easily ground.

The following are some examples of the practical employment of the process:

Example 1

100 parts of cellulose acetate in powder are mixed with about 45-55 parts of paratoluene sulphonamide or other plasticizing agent and the mixture is melted together in a heated pot. The molten mass is then run into slabs or sheets which are ground to powder and mixed with about 10-200 parts of powdered filling material, for instance a mixture of lampblack, red oxide of iron and barytes. The mixture of ground material and filling material, preferably after working up or kneading on heated rolls, can be molded or pressed under heat into matrices or molds to form phonograph records or other molded or pressed articles.

Example 2

100 parts of cellulose acetate in powder, about 45-50 parts of triacetin, or mixed isomeric xylene mono methyl sulphonamides or other liquid high boiling alkylated xylene-, toluene- or benzene sulphonamide derivative or preparation (such as specified in British Patents 132,283, 133,353 or 154,334) and about 6-10 parts of triphenyl phosphate are melted together in a pot and afterwards run into sheets or slabs for solidifying and then ground to powder, which may them be further worked up to molded or pressed articles in a similar manner to that described in Example 1.

Example 3

100 parts of cellulose acetate in powder, about 80 parts of rosin and about 70 parts of paratoluene sulphonamide or a liquid high boiling alkylated xylene-, toluene- or benzene sulphonamide derivative or preparation (such as specified in British Patents 132,382, 133,-353 or 154,334) are melted together, with or without addition of a small quantity of one or more substances such as stabilizers (e. g. urea or alkyl or aryl urea derivatives), triphenyl phosphate, dyes, pigments or other effect materials, or filling materials, and the melt after cooling and solidifying is ground to powder, which be further worked up to molded or pressed articles in a similar way to what is described in Example 1.

Some of the claims are:

1. Process for the manufacture of molded articles, comprising melting a mixture comprising an organic derivative of cellulose and a plastizing agent, allowing the melted mass to solidify, pulverize same, and pressing under heat to required form.

14. In a process for the manufacture of molded articles, the steps of mixing and melting together ingredients comprising an organic derivative of cellulose and a plasticizing agent, allowing the melted mass to solidify, pulverizing same, and working up the powdered material on heated rolls.

21. Process for the manufacture of molded articles comprising melting a mixture comprising cellulose acetate and a plasticizing agent, allowing the melted mass to solidify, pulverizing the same, and pressing under heat to required form.

22. Process for the manufacture of molded articles, comprising melting a mixture comprising cellulose acetate and a plasticizing agent, allowing the melted mass to solidify, pulverizing same, working up the powdered material on heated rolls, and pressing under heat to required form.

Peat as a Plastic Material

VARIOUS processes are known, in which peat is pulverized or disintegrated and, if necessary deacidified and compressed in the dry and wet condition with the addition of binding substances, impregnating bodies or other materials, such as gypsum, sulphur, loam, clay, calcareous sandstone, resin, alcohol, glue, tar, water glass, etc. According to all these known processes the natural fibrous structure of the peat is destroyed, so that the products (for instance, plates or the like) obtained by such processes exhibit a uniform or almost uniform coloration.

The process, according to a recent invention (U.S.P. 1,625,-066; April 19, 1927, of Tiete Viersen, of Ter Apel, Netherlands) is characterized by the feature, that pieces of natural bog deposit or peat ranging from 8 to 8000 cubic centimetres in size are first dried out until their water content is 10% or less and are then compressed at a pressure of from 25 to 300 atmospheres per square inch.

The plates or other objects produced in this way may be polished, rubbed down, burnished or, if desired, coated with impregnating substances.

The object of the process is to obtain an art-decorative material of great architectural value. In consequence of the varying runs of the fibres the products obtained have a wonderful color gradation or graining effect (light

(*Continued on page 477*)

Inventors Active in Zyl-Frame Field

Novel ideas shown in a number of recent patents tend toward simplification in production methods

Compiled from the Patents by Carl Marx

ONE can hardly pick up a single issue of the Official Gazette of the U. S. Patent Office without finding therein a least one patent relating to the manufacture of the ever popular pyroxylin or "Zyl" eyeglass and spectacle frame. The tremendous increase in the use of this material, together with the recognition that it is better to get eyeglasses before one is himself aware that one needs them; the use of protective goggles in industry and for the sportsman who knows enough to guard his eyesight from the glare of the sun, both winter and summer; and the change over from the older metallic rims; all these elements contribute to the necessity for more modern methods of production.

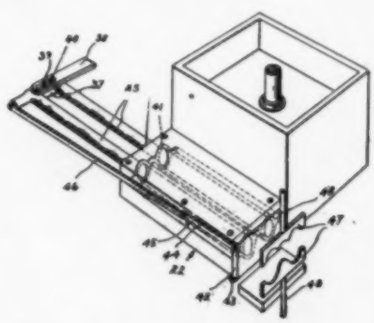


Fig. 2. Illustrating the Fraser extrusion process.

We have often discussed the methods of production of Zyl frames in the pages of this magazine, as the processes used, while primarily designed for the fabrication of such frames, nevertheless showed the general progress that was being realized in the field of molding and shaping the pyroxylin plastics.

The following short resumé of this prolific art covers only the period from May 31, 1927 to July 26, 1927, or less than two months. Undoubtedly, this industry is of New England, as all of the concerns that control this industry are located either in New York state or in the New England States, and especially Rhode Island and Massachusetts State.

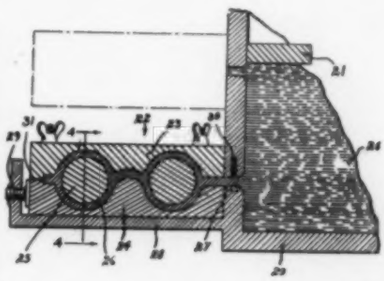


Fig. 3. Showing the Fraser method of forming blanks for zyl frames.

The first method, in point of chronology, is that patented by Frank Fraser, 1,630,262, May 31, 1927, and assigned to the American Optical Co, Southbridge, Mass. This process is on the order of an elaboration of a similar method patented by the same inventor (U. S. P. 1,607,522; Nov. 16, 1926), which was described in PLASTICS some months ago.

Extruding and Pressing

In its broadest form, the present method covers the extrusion of a plastic mass of pyroxylin into a suitable mold that is capable of producing a long durable tubular member from which individual eye-glass frames can be cut, with the additional use of a mold to compress the material. After the frames are cut, they are placed in a second mold and shaped; so that milling, etc., is avoided. The patent even goes so far as to describe a substitute method for polishing. This is accomplished by dipping the frames into a suitable solution, the nature of which is, however, not disclosed.

The technical description of Fraser's method is necessarily rather involved, and 14 figures are required for a complete understanding of the invention. However, a very good idea of the method involved can be obtained by a study of figures 2 and 3 of the patent, which are reproduced herewith.

Operating Details

The plastic zyl mass is contained in the box-like member 20, which in reality represents an hydraulic pressure chamber from which the zyl mass 26 is forced into the molds 24. It will be noticed that in the present case the material enters the mold from the side instead of the end, although this way of doing it is also contemplated by the inventor. As will be seen from Fig. 3, the mold consists of two parts, which can be separated to remove the tubular blank. This blank is then sliced into individual frames, which are placed in molds to give the proper outline to the bridge and rims. Needless to say, this method produces not one particle of waste, which is a decided advantage, and more than offsets the increased cost of equipment and dies.

New Style Hinges

The next patent to be considered in our review, is that of Earle J. R. Beatty, assignor to the Universal Optical Co., of Providence, R. I.; U. S. P. 1,635,699; July 12, 1927. This involves a very neat method

for forming the hinges by means of which the temples are attached to the frame, so that, although the hinges are metallic,

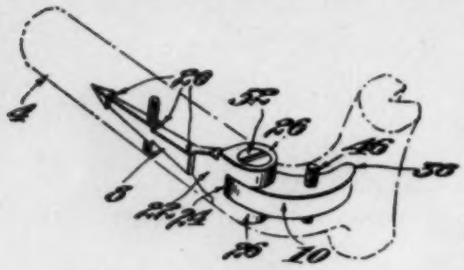
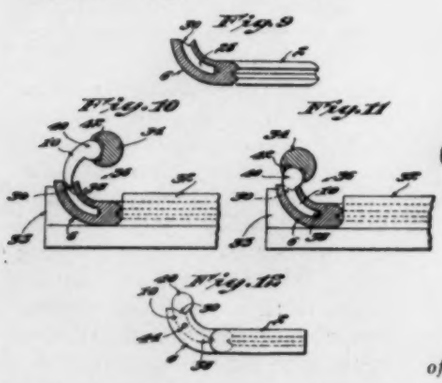


Fig. 3—Beatty's Hinge

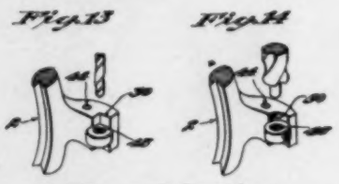
the metal will not be exposed, but the hinge will be within the zyl material itself.

As claimed, the method involves boring an end piece of a zyl mounting to produce a bore closed on all sides except at one end, bending the end piece to cause the bore to assume a curved form, holding the mounting against displacement, driving into the bore through the said end a metallic hinge element curved to the shape of the bore, but somewhat thicker so that it will be held in place. To make doubly certain, a hole is bored through the zyl and the metallic member and a rivet is put through it as well.



Steps in forming the zyl-covered hinges.

The invention is best understood by looking at figures 9 to 12 of the patent in question, which figures are reproduced herewith. The bore 28 has inserted in it the metallic hinge element 10 inserted by a special machine. It is held in place by a rivet put through the hole 44 shown in fig. 12. The method of attaching the hinge to the frame will be evident from figs. 13 and 14, also reproduced, and fig. 3 shows the complete assembly.

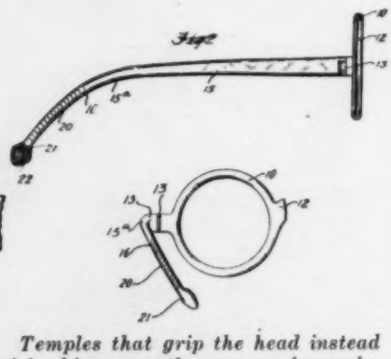


Drilling and Reaming.

New Forms of Temples

On the same day, and just one hundred numbers further along, Edwin D. Nerney, was granted U. S. P. 1,635,799; July 12, 1927, assigned to the Bay State Optical Co., of Attleboro, Mass. This concerns an improved form of zyl covered temple that has a specially designed end that serves to hold the eyeglasses firmly and securely in place, but which is particularly comfortable to the wearer. We show only figs. 2 and 3 of this patent, but the construction will be clear from this.

Considering now in general the shape of the temple bars shown in these drawings, it is seen that they extend rearwardly in a substantially straight line to the portion which is



Temples that grip the head instead of hooking over the ears as formerly.

positioned substantially over the ear of the wearer. From this portion they are curved or bent toward each other, their extreme ends extending well around to the back of the head. These temple bars do not hook over the ears of the wearer, as is usually the case, but are held by the ends curving around the back of the head. A metallic core is provided, and the end of the temples are made resilient, and a spatula shaped terminal piece is also provided.

Tubing for Frames

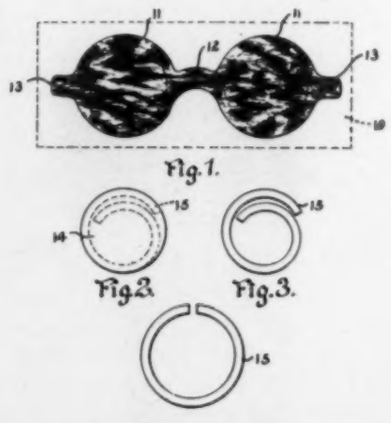
Nelson M. Baker and Frank Fraser, assigner to the American Optical Co., Southbridge, Mass., also got a patent on July 12, 1927, U. S. P. 1,635,881. This covers a modification of one of their older methods for making eyeglass frames from rolled tube stock. Zyl tubing is crushed in to form the lens groove, is cut into proper lengths and then formed into a ring, which is cemented to form the lens frame. The bridge is made separately, and the various parts are assembled by cementing. A somewhat similar process from the same inventor was described in PLASTICS for November, 1926, page 403 and no illustration is required.

Spiral Rings for Demi-Amber Rims.

Elmer L. Schumacher, who already has a number of patents in this field to his credit, comes to the front with an interesting modification for making demi-amber zyl frames. His patent, July 26, 1927, No. 1,637,029: assigned to the American Optical Co., of Southbridge, Mass., describes the method somewhat as follows:

Schumacher makes use of the fact that zyl is a material that has an inherent tendency to return to its original shape, even though it has been molded or

(*Continued on page 477*)



The Schumacher Rim.

Furfuraniline For Hardening Artificial Resin

Aniline and furfural combined with phenol-aldehyde resins yield a product suitable for cold molding.

The present article is based on the disclosure contained in a patent issued to the American Insulator Corporation, on an application by Trevor S. Huxham. The combination of these ingredients into one composition presents some interesting possibilities for the industry.

HERETOFORE, in the manufacture of compositions for cold molding, it has been customary to employ resinous substances such as asphalts, coal tar pitches, and natural resins as binders for asbestos, mica, or other fillers. These resinous substances are usually fluxed with drying oils prior to mixing with fillers. After molding, the products are subjected to a prolonged baking operation, during which they become insoluble and infusible. Vast quantities of these materials are employed in molding insulation for electrical wiring devices, such as connectors for electric irons, extension light plugs, receptacles, double and triple light sockets, switch bases, etc., as well as automobile radiator caps, handles for steam valves, automobile horn buttons, knobs, and sockets for radio apparatus, etc. Because of the increasing cost of the natural resins and the wide variation in the properties of asphalts and pitches, the manufacturers of cold molded plastic products have turned to synthetic resins for use as binders in order to obtain more uniform products.

Problems in Cold Molding

Attempts have been made to employ the condensation products of phenols and formaldehyde and its polymers as binders for cold molding compositions. Several methods have been tried but all these have one or more serious faults. If the condensation product is prepared with only a mild catalyst or without a catalyst the odor of formaldehyde given off by the product is practically unbearable when large quantities are being handled. This is particularly true during the process of mixing with the filler and subsequent molding or pressing. The composition prepared from this product with a filler also has a great tendency toward adhering to the mold surface. This causes much difficulty. When the formaldehyde, required to carry the reaction over to the thermorigid stage, is present in a combined form as in combination with ammonia or aniline, forming hexamethylenetetramine or anhydro-formaldehyde aniline, respectively, the odor of the product is eliminated but another serious fault develops. In this case, the product which is a viscous liquid, is unstable due to the large amount of catalyst present and must be used immediately or it will harden, as the reaction proceeds, forming a worthless mass.

For Hot Molding

The second method above described is employed in the preparation of compositions for hot molding. In this case, the condensation product is solid at normal temperatures and in solid phase, the reaction does not proceed until the temperature is raised. However, for cold molding, the liquid or semi-liquid phase is required to make the composition plastic at normal temperatures. Inasmuch as it is highly important that the product may be stored for a period of several weeks or a month without spoiling, the employment of a powerful catalyst in substantial quantities is not permissible.

Other Proposals

It has also been proposed to produce a fusible synthetic resin by the action of formaldehyde on phenol and to add thereto furfural or furfuramid in the proportion of 8 to 40 per cent of the fusible resin thus produced, the thus treated product being then subjected to heat or to heat and pressure, whereby a hard and infusible product is obtained. This product has the serious disadvantage that it must be molded hot and that it hardens or sets slowly during such molding process.

It is known that certain amines of the aromatic series react with furfural even at atmospheric temperature to form resinous substances. See Meunier (Les Matiéres Grasses, 1916, 9, 4516); Mains and Phillips (Chem. and Met. Engineering, Vol. 24, p. 661, 1921). Aniline is particularly suitable and when mixed with furfural in substantially equi-molecular proportions generates heat and becomes turbid due to liberation of water. Water may be removed by evaporation or addition of a dehydrating agent, such as $CaCl_2$, and subsequent separation of the two layers formed. Continued heating yields a dark red to black resin, hard and brittle at 25° C.

The foregoing is quoted from a patent of Trevor S. Huxham, U. S. P. 1,606,943, which has

(*Continued on page 478*)

The World Trade in Plastics—

I. Great Britain

An authorative statement from the United States Bureau of Foreign and Domestic Commerce

By C. Grant Isaacs

U. S. Assistant Trade Commissioner

WITH the aid of its foreign representatives, the Chemical Division of the Bureau of Foreign and Domestic Commerce, (Chief Mr. C. C. Concannon), recently compiled a series of reports entitled "World Trade in Plastics." As these reports should be of immense interest to all sections of the domestic plastics industry, the gist of them will be reproduced from time to time. This month is outlined the Plastics Trade of Great Britain, as compiled by the Bureau's London representative, Assistant Trade Commissioner C. Grant Isaacs.

THE plastic trade in Great Britain is divided between importers and British manufacturers. As with many other British industries, statistics of production are not available and so it would be difficult to measure the total volume of business. The pyroxylin plastics constitutes the principal class, with the casein solids second. Some synthetic resins are used, but quantities are relatively small.

British Xylonite

One of the principal pyroxylin plastics known on the British market is "Xylonite", the product of the British Xylonite Co., the chief manufacturers of these goods. This firm is the oldest in the trade and has been established 50 years, now operating two factories. One plant is devoted to the production of Xylonite and the other to the manufacture of finished articles. Although the quality of Xylonite products is regarded as unexcelled, the prices are generally higher than Continental or imported goods. Fully 50 per cent of this company's production is exported, a fair estimate of the percentage of the total production of British plastics exported. There are a few other smaller manufacturers but their goods are reported to be of inferior quality.

Pyroxylin Plastics

Pyroxylin plastics are used for many purposes, but of major importance are novelty and toilet goods, cutlery handles, wireless accumulator boxes, motor glass screens, and films. As in other countries, the present vogue for shingled hair has reduced the demand for combs to a minimum. There is a large trade in films, film base, and film wastes. The bulk of the film base entering Great Britain is imported from the United States. It is estimated fully 95 per cent of imported film is received from the United States, a trade chiefly in the control of one firm. Germany and France are the principal foreign sources for imported raw pyroxylin. German pyroxylin prices are generally about 10 to 20 per cent less than British prices but the quality is reported to be lower. Pyroxylin plastics are imported chiefly in sheets with a fair quantity in rods. Current prices of opaque pyroxylin in thick sheets are about $0.95 to $1.10 per pound.

Non-inflammable Products

One factory is producing a non-inflammable substance which is gaining in reputation. This product is known as "Colastoid" but the prices are prohibitive for many uses. The usual base of non-inflammable plastics is cellulose acetate, on which there is assessed in Great Britain an ad valorem duty of 33⅓ per cent. Despite this tariff it is believed a demand for an Tmerican non-inflammable product could be developed in the British market. One or two large works in Germany produce this class of plastics but with a very small exportable surplus. Prior to the World War British plastic manufacturers exported considerable quantities to Germany. Business warranted that one firm (British Xylonite, Ltd.) maintain offices there.

Casein Solids

Casein plastics may be described as competitors of pyroxylin plastics. The prices of casein plastics in Great Britain are about half those of pyroxylin. Casein plastics in sheet form are offered for $0.50 to $0.60 per pound. The largest producer of this class of plastics is the Erinoid Co., Ltd. Another important firm is the Aberdeen Combworks Co., Ltd. The British Xylonite Co., Ltd., also produces a casein plastic sold under the trade name of "Lactoid." Casein plastic products from Czechoslovakia are now prominent on the British market. Raw materials are likewise imported from that Continental source. The production of synthetic resins or the "imitation amber" plastics in Great Britain is very small. Only one product "Lapelik" is known on the market.

Casein Imports Increasing

The growth of the British casein plastics industry probably accounts for the marked increase in the imports of casein during recent years. The principal sources of supply are Argentina, New Zealand, and France. Exports of British casein are negligible. In 1924,

5,543 tons were imported and 1,123 tons were re-exported.

Styles in Plastics

Styles in pyroxylin plastics do not change in Great Britain as in some markets. At present, however, there is a considerable interest in sheets made to resemble mother of pearl. There is now sold on the British market a line of Belgian novelty goods, of which the basic component is a rubber compound. The British market offers the possibility of selling a new line of this class of merchandise, providing it is unique and is offered at competitive prices.

Imports of Plastics

Pyroxylin plastics and other similar materials are imported into Great Britain chiefly from France and Germany. Imports during the years 1920-1924 averaged in value about 149,000 pounds sterling, which total includes both raw materials and manufactured goods. In 1925 over 126,000,000 linear feet of blank cinematograph film were imported into Great Britain, valued at $1,732,765. Belgium, France, and the United States are the principal sources of supply for blank film. A large proportion of the buttons imported into the United Kingdom are manufactured of plastic materials. Approximately 2,862,000 gross of buttons valued at $1,076,650 were imported in 1924.

Imports

Origin	Sterling 1924
Germany	48,364
France	112,663
Italy	2,076
Japan	269
United States	105
British Possessions	135
Other foreign countries	13,200
Total	176,812

Exports of Plastics

Great Britain's export trade in pyroxylin and similar plastics is considerably larger than the volume of imports. Exports of both raw and manufactured goods were valued at $1,135,940 in 1924. Colonial markets—South Africa, Australia, New Zealand, and Canada—are the leading consumers. Fair quantities of the imported materials are reexported, shipments likewise going principally to South Africa, Australia, and New Zealand.

DISTRIBUTION OF BRITISH EXPORTS OF PYROXYLIN PLASTIC GOODS IN 1924 (including re-exports) TOTAL £257,128

Australia	£150,812
Canada	37,289
New Zealand	24,846
South Africa	15,314
British India	3,753
Sweden	3,003
Countries with less than £3,000	15,339
Other British Possessions	6,772

Value of Re-Exports

Destination	Sterling 1924
Foreign countries	3,311
South Africa	7,229
Australia	65,483
New Zealand	14,957
Other British possessions	6,762
Total	97,742

Distribution

Both importers and manufacturers usually carry stocks. Due to the inflammability of pyroxylin plastics, the storage rates are high and, therefore, the manufacturer of novelty and other goods practically refuses the risk—more or less forcing the responsibility on to the raw material importer or manufacturer. Importers and manufacturers of finished goods alike sell direct to the retailers and both generally employ traveling salesmen. Producers of the raw materials also manufacture various classes of finished articles, as, for example, the British Xylonite Co., Ltd., Plastics are sold through agents on a commission basis or through agents who buy on account and carry stocks. Many engaged in the trade consider the latter method essential for successful distribution. In the distribution of novelty or similar goods, manufacturers find it difficult to prevail upon wholesale merchants to carry a complete range in stock. One important firm which now sells to both the wholesale and retail trade, is considering a change in policy whereby the company will sell to a larger extent to the retail territory and employ a full complement of traveling salesmen to cover the British Isles.

Trade With the United States

Great Britain has been looked upon as a good market by American exporters of plastics in recent years. According to the export statistics of the Department of Commerce, the United States exported 791,135 pounds in sheets, rods, or tubes, valued at $926,991 in 1925, against 702,757 pounds, valued at $625,187 in 1924. In 1923 our exports exceeded $1,200,000. The large cutlery manufacturers in Sheffield consume large quantities for handles.

The American and the British manufacturers do not place their pyroxylin on the Sheffield market until after the material has been seasoned twelve months, on the other hand the French and German manufacturers send their product to Great Britain before it has been sufficiently seasoned or matured.

On account of a duty of 33⅓ per cent ad valorem on handles it is impracticable to import into Great Britain pyroxylin cut in sizes suitable for handles. If the pyroxylin is brought in in the form of sheets, rods, or tubes, no duty is payable.

Suggestive Methods of Trade

It would be advisable for American exporters to secure agents or distributors in London. In order to secure the trade of the Sheffield cutlery manufacturers it would be better to establish an independent

(*Continued on page 480*)

Blood and Shellac Plastics 50 Years Ago.

Even then inventors were busying themselves with the problems of molding compositions

By Carl Marx

"Nothing new under the sun" is quite appropriate when discussing certain types of plastics. Although recently revived, blood and shellac plastics are venerable pioneers in this field.

MUCH stir has been caused lately by the advent of the blood plastics, especially such as are imported from Europe. Considerable prejudice appears to exist regarding these useful products, which, chemically at least, do not differ so very much from the casein solids which enjoy such great popularity.

It may surprise some of our readers to learn that there is nothing new about blood plastics at all. In fact over fifty years have passed since the patents have begun to issue on this subject. As many workers are now experimenting with blood as a base for plastics, and as they might be tempted to obtain broad patent protection for their ideas, it may be worth while to call attention to some real early patents on this absorbing subject.

An Early Blood Plastic

For example, back in 1877, 50 years ago on August 7th, patent No. 193846 was granted to F. O. Badger on a blood plastic, the claim reading as follows:

"The process of treating blood alone for making articles of use or ornament by reducing it to a dry powdered or fine condition, and subjecting it to heat and pressure in suitable molds, substantially as set forth."

Only three years later, March 16, 1880, Wilford L. Palmer was granted U. S. Patent No. 225638 for making buttons or other articles from plastic materials, and especially from blood by "placing the material in a die sufficiently cool, then heating the die to a temperature above the boiling point of water and pressing the material therein contained by means of plungers.

So it is evident, that, after all, the present vogue of blood plastics is nothing more than a revival. More modern presses and production methods will undoubtedly put this otherwise wasted material over in good shape once the public realizes that there is nothing "nasty" about blood plastics. Inasmuch as the blood is usually hardened by heat, or by formaldehyde, it becomes insoluble and perfectly innocuous. Furthermore, blood plastics are not red, as it seems some of our correspondents seem to believe, but are brownish yellow, or, by addition of coloring matter, turned into almost every shade except pure white.

For buttons, and the like, they are every bit as useful as horn, or casein solids.

Other plastics also enjoyed early popularity with the inventors. About the same time, Mr. J. M. Merrick, Jr., patented a mixture of shellac, silica and infusorial earth as a plastic in 1868 (U. S. P. 85018), and J. Gardner, in the same year obtained protection for picture frames, curtain knobs, etc., made of sawdust, rosin and shellac (U. S. P. 73088). Two years later, 1870, Wm. B. Gleason, of Boston, combined gelatin and wood flour into a useful plastic (U. S. P. 101119).

Quite evidently, ours is an old and venerable art, but real progress dates from the time when chemistry got in its fine hand, and really startling developments came from the work of Parkes, Spill, Hyatt, Spitteler and Baekeland.

Button Men to Form New Association

VEGETABLE ivory button manufacturers are to organize an association. A preliminary meeting, at which 90 percent of the industry was represented, was held recently in Merchants' Association assembly rooms, according to N. O. Broderson, who was appointed temporary secretary.

P. H. H. Dunn, Bureau of Simplified Practice, U. S. Department of Commerce, at this meeting urged the trade to form an association, that it might benefit from the advantages of greater and more direct connection with the various departments at Washington. A unanimous vote of the manufacturers upheld the suggestion.

L. M. Shamberg, New England Button Co., Newark, was named temporary chairman. Mr. Broderson is secretary of the Rochester Button Co., Rochester. The vegetable ivory button industry's chief centers are Newark and Rochester.

Among the principal aims of the association will be standardization of cost systems and the solution of marketing and labor problems. Cooperation in these and other pertinent matters was pledged by Mr. Dunn.

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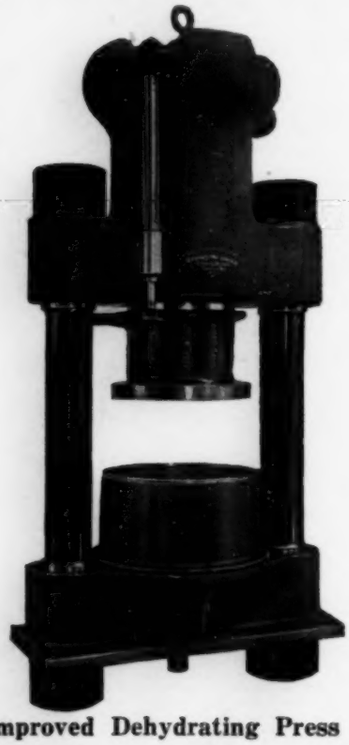

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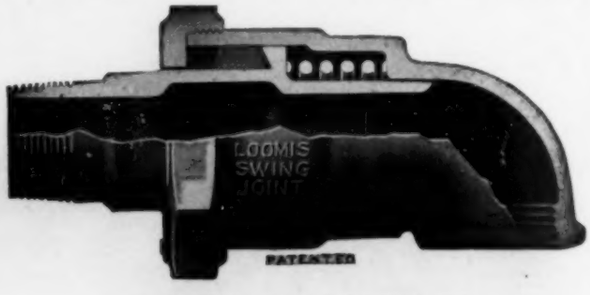

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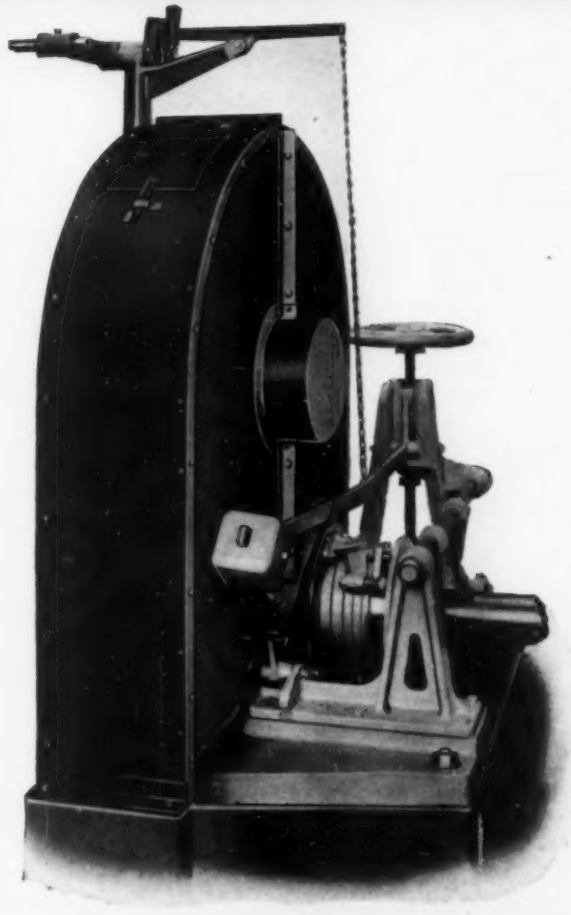

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Late Developments Bring Rubber into the Plastics' Field

Hot and cold molded products now possible with molding composition made from rubber latex

NO apology is needed for the present article as recent developments have shown that the direct molding of latex compositions, and of combinations of rubber and casein are practical. The production of a dry flaky molding powder from raw rubber latex is a considerable step in advance over common hard vulcanized rubber as far as adaptability is concerned.

IN the past, PLASTICS has given little if any heed to articles made from rubber, either elastic rubber, or of the molded hard rubber, as it was believed that this material was somewhat outside of the scope of the publication, and was ably taken care of in the numerous rubber trade journals. Furthermore, the methods of production, which involved vulcanization that took a long time, as contrasted with the almost instantaneous molding of plastics, has also served to differentiate rubber from the other modern plastic materials.

Lately, however, there has been a decidedly new tendency in the rubber art, and the production of both cold molded, and rapidly hot-molded products based on rubber resins and the like have made their appearance. Various forms of chlorinated rubber, and similar products have appeared on the market, and now a process has been described that, in its essentials, comprises using rubber merely as a binder for filling materials, so that the product can be handled much like the regular well known plastics.

"Latex Molded"

The patent on this process calls it "Manufacture of Molded Articles from Latex". Latex is the natural fluid obtained from the rubber trees. By suitable chemical reactions, such as precipitation, the rubber gum is obtained from this latex. Recently, however, means have been developed that allow the natural latex to be shipped from the rubber plantations directly to the rubber factories in the United States, and hence processes employing this natural latex are becoming of increasing importance.

Fillers Used

The invention in question was made by Chauncey C. Loomis and Horace E. Stump, of Brooklyn, N. Y., and the patent rights have been acquired by the Hevea Corporation, of New York. In the patent, U. S. P. 1,634,293; July 5, 1927, (on an application filed Aug. 22, 1923), the process is described about as follows:

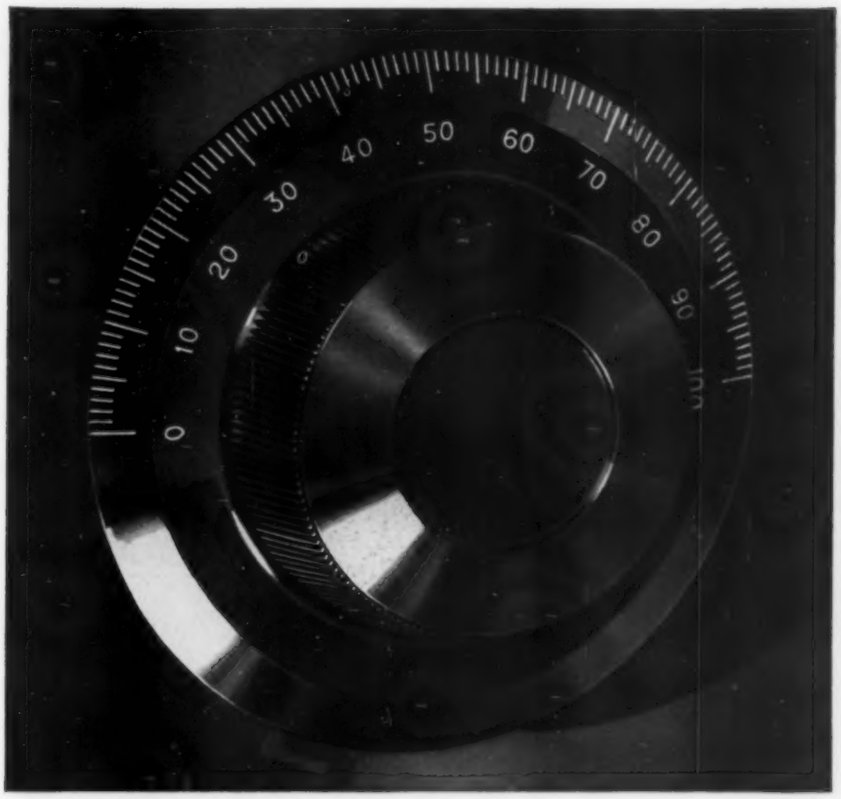
In practicing the invention the inventors contemplate the dry molding of a suitable mixture of latex with fillers through the coagulation of the mass in the presence of large volumes of water, permitting the resultant rubber or partially coagulated latex to attach itself to the particles of filler rather than separating out in lump condition. Preferably a mixture of wood flour, zinc oxide or other rubber filler together with the sulphur necessary for the vulcanization of the rubber is suspended in water. Along with the fillers there is added a catalyst as thiocarbanilide if a hot molding is to be accomplished, this catalyst being omitted if the molded article is to be cold cured. Sufficient water is added to insure the mass being in suspension in water and to this a quantity of latex is introduced.

The resultant mixture is constantly agitated while a suitable coagulant is added in amount to partially coagulate or agglomerate the colloidal particles. The amount of the coagulation is sufficient, and preferably only sufficient to break the suspension and cause the filler and the coagulated material to precipitate or settle out. If the proportions of the various ingredients have been properly chosen the settling out or precipitating of the material will not produce or form the solid mass characteristic of coagulated rubber but will produce a granulated or flaky condition. The water is then drained off and the material dried at a low temperature. Thereafter it may be hot-molded by putting it in a mold and pressing and heating the same to compress the articles into a firm mass and vulcanize the rubber.

Some Examples

An example of a mixture is as follows: wood flour, 15 gms.; zinc oxide or clay, 15 gms.; rubber latex, 36% rubber, 10 c. c.; sulphur, 5% of rubber used; catalyst (mild and incapable of so-called cold cure); water 700 c. c. This mixture gives about a 10% rubber content in the material and it has been discovered that with such a low percentage of rubber firm, tough materials will be molded. Manifestly the proportions may

(*Continued on page 479*)



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EDITORIAL · IMPRESSIONS

Plastics and the Age of Synthesis

UNDER the caption, "The Synthetic Age—a New Step", an editorial writer in the *New York World* calls attention anew to the contributions of synthetic organic chemistry to the progress of civilization. Plastic materials are synthetic *par excellence*. They include artificial products replacing—and often with advantage—the whole gamut of materials in nature's three classifications. In the vegetable kingdom, wood and resins, in the animal, horn, ivory and whalebone, in the mineral, amber, semi-precious stones and jade, are a few of the chemists' achievements in synthesis.

Nor does the march of progress show any sign of slowing down. The pages of PLASTICS are replete with new synthetic materials, while renewed interest in cellulose acetate may mark a turning point in the pyroxylin plastics industry.

Synthesis, moreover, goes to the roots of the industry. For many of the raw materials themselves have succumbed to its efforts and, as a result, the supply of phenol, acetic acid and formaldehyde is no longer dependent on the products of the destructive distillation of coal and wood. Synthetic camphor long ago relieved the situation arising from the virtual Japanese monopoly. Urea, an important ingredient of synthetic glass-like products and one of the first natural products to be prepared in the laboratory is now wholly made synthetically.

There is one natural product, however, which has so far successfully defied the onslaughts of the organic chemist—shellac. In spite of a whole host of so-called substitutes, shellac remains pre-eminent in its own province, and now, as originally, holds undisputed sway in the field of phonograph record manufacture.

* * * * *

Proverbial Silken Purses

THE saying about silk purses and sows' ears is so trite that we refrain from quoting it. However, its application seems to be somewhat in doubt when considered in connection with certain developments in urea resins and other materials for the plastics' industry.

While the supply of urea derived from natural sources is negligible when compared with the quantity produced synthetically, yet the fact remains that the two products are identical. So much for the "sows' ears."

How about the "silk purses?" Time and again the attention of readers has been called to the manifold possibilities of the glass-like urea resins. While in their present early state of development they cannot be regarded as complete substitutes for glass, they can be manipulated without furnaces and blowpipes. Again they have many valuable optical properties, transmit ultra-violet light, and—a very important point—fracture with difficulty and without sharp splinters.

Indeed, if the far-reaching claims made for these synthetic glasses are substantiated, here are products combining the optical properties of quartz glass and the resistance to shock of mica with the ready workability of the organic plastic.

PLASTICS

Possessing such attributes, it is not to be wondered at that these materials are arousing keen interest in many widely different industries. Evidently there is room for their development in this country.

* * *

Windows, Plastics and Health

RECENT studies on vitamins, the nutritional value of foods, the curative effects of sunlight and the relation of all these to ultra-violet light, have served to re-emphasize the important part played by the latter in the maintenance of health and general efficiency.

One result has been a demand for material more transparent to ultra-violet light than ordinary glass. To meet it, several varieties of glass are being marketed.

In this connection, it is well to remember that the pyroxylin and cellulose acetate plastics as well as the new synthetic resinoid glasses have this property. They are, moreover, much less fragile, and providing their resistance to weathering is sufficient, should be keen competitors, for certain purposes, of the special glasses already referred to.

* * *

Trade Stability

THE soundness and basic stability of American business today is proven by the slight reaction to the usual hysteria of the presidential year.

Not only is there no slacking off of good conditions but every indication points to unprecedented prosperity this fall. The plastics' industry has already felt the upward trend as evidenced by increased activity all along the line.

Celluloid Company's Stockholders Authorize Merger with Celanese Corporation

AS outlined in PLASTICS for August, the consolidation of the Celluloid Co. with the Celanese Corporation with a view to the manufacture of non-inflammable plastics of cellulose acetate has been duly passed by the stockholders of the former organization.

The meeting took place at the Celluloid Company's offices in Newark, New Jersey, August 29, and was marked by enthusiasm. Robert Campbell, who will preside over the new Celluloid Corporation received a hearty vote of thanks for his services.

Present plans call for a new plant at Cumberland, Maryland, for the manufacture of the cellulose acetate base to be fabricated at the Celluloid Corporation's present plant in Newark.

The Revival of the Phonograph

MOUNTING exports indicate that the phonograph industry is once more progressing in spite of the inroads of the radio. Returns for the first half of this year show an increase of 60 per cent as compared with the corresponding period of 1926. This is reflected in the figures for exports of records. These reached $1,364,000 an increase of $314,500.

German record exports have also risen. In 1926 the increase amounted to 1,197,713 records with a value of about $333,000. In this connection, it is worthy of note that the important Japanese Nippophone Company has disposed of 86 per cent of its capital stock to the Gramophone Company of London and the Carl Lindstrom Aktiengesellschaft of Berlin.

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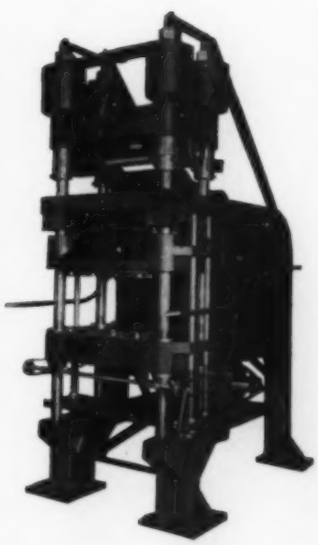

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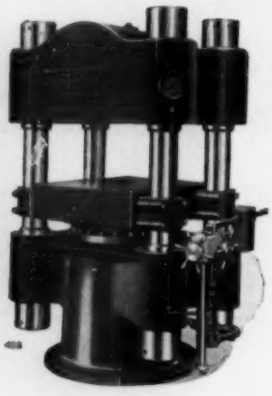

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Phenol Resinoid Brake Linings

THE Bakelite Corporation has been granted patent 1,608,165, Nov. 23, 1926, on the application of Sanford Brown and Sigfried Higgins covering an ingenious method of producing a phenol-resin impregnated fabric comprising asbestos and cotton fiber; and suitable for making brake-linings, gaskets, packing-material and the like.

Whatever the composition of the fabric, the invention insures thorough and uniform impregnation of the same with a desired impregnating material, preferably a phenolic condensation product. This is accomplished by impregnating the fibrous material of which the fabric is to be composed at a time previous to the manufacture of the fabric from the fibrous material. Preferably the fibrous material such as asbestos and cotton fiber is treated with the impregnating material while the fibre is in the form of a loose layer, before the same has been twisted to form yarn. Preferably also the impregnating material is applied to such layer of fibres in the form of a dried powder.

Impregnated Fabric Woven

In the subsequent manufacture of yarn and of thread from the yarn, this impregnating material will be thoroughly and uniformly distributed throughout the body of the yarn and of the thread so that when the fabric is woven from the thread the impregnating material will be thoroughly and uniformly distributed throughout the body thereof. Preferably the layer of fibrous material is folded over upon itself several times after the impregnating material has been placed upon it, so that the impregnating material will then be distributed between the several plies or layers of the folded material. This folded material

is then twisted to form yarn with the fibrous material between the convolutions and the further twisting and condensation of the material in the formation of thread from yarn will of course leave the impregnating material distributed thoroughly through it. When the fabric has been formed from such thread, heat treatment or heat and pressure treatment may be applied, which in the case of a phenolic condensation product impregnation will cause the powdered impregnating material to melt and flow and subsequently to harden without disturbing the uniform distribution of the same throughout the mass.

Asbestos Base

In the manufacture of asbestos fabric, asbestos rock is crushed and formed into a soft mass of long fibers which are then beaten and carded etc. to produce a rather coarse sheet or layer. The fiber from the first beating machine is commonly fed into a second beater and carder and long staple cotton, which has been previously carded, is mixed with the asbestos by hand in the proportion of about 7/8 asbestos and 1/8 cotton, as the asbestos travels on the feeding chute on its way to the beating machine. This mixture passes into a cylinder where the cotton and asbestos fibers are tumbled together and it is then passed through the carding cylinder and comes from the machine in the form of a fibrous layer.

Impregnating with Dry Material

The impregnating material which preferably is in the form of a dry powder may be deposited upon the asbestos and cotton as they come from the carding cylinder, just mentioned, or as the same are tumbled together, or previous to the tumbling operation. Preferably, however, the impregnating material is deposited on the fibrous layer as the latter is delivered from the fine carding machine to which the layer produced by the

(*Continued on Page 475*).

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TECHNICAL ABSTRACTS
AND PATENT REVIEW

U. S. Patents on Phenol-aldehyde condensation products. Dr. Aladin, Kunststoffe, 1927, **17**, 83.

A concise review of 40 U. S. Patents (1919 to date) covering the preparation of phenol-aldehyde condensation products.

Regenerating Photographic Films. By Dr. Rolle. Kunststoffe, 1927, **17**, 90.

The same article as was reproduced in full in **Plastics** in 1926 (Vol 2 p. 225).

Ethyl Lactate as a Cellulose Ester Solvent. H. Wolff, Farbe und Lack, 1926, 276; through Kunststoffe, 1927, **17**, 92.

Ethyl lactate (ethyl ester of lactic acid), is an excellent solvent for cellulose nitrate, cellulose acetate and for pyroxylin plastics. As, chemically, it has some of the properties of both an alcohol as well as an ester, it combines the advantages of both. The properties of ethyl lactate are: Boiling point, 150°C; saponification value=460; specific gravity 1.03. As the ester is anhydrous, it will mix with benzene and other non-solvents without producing cloudiness. The odor is attractive, and lacquers made with this solvent dry with a high luster.

Photographic film. Samuel E. Sheppard and Sterling S. Sweet, assignors to Eastman Kodak Co., U. S. P. 1,623,500; April 5, 1927.

A highly flexible and durable photographic film is prepared, consisting of the following layers: light-sensitive colloid layer as gelatino-silver haloid emulsion, cushioning stratum as a composition containing preferably depolymerized rubber mixed with a resin, adhesive layer as a cellulose ester containing at least one fatty acid group having more than four carbon atoms like cellulose stearate, cele. n-valeryl-acetate etc., cellulose ester support as cellulose acetate, cellulose ether, or cellulose nitrate.

Pyroxylin solvents. H. S. Garlick, Industrial Chemist, 1927, **3**, 54.

A resume of the properties of the pyroxylin solvents, in tabular form.

Linoxin-like synthetic products. W. O. Herrmann and H. Deutsch, assignors to Constortium fur Elektrochemische Industrie, Germany. U. S. P. 1,625,852; Apr. 26, 1927.

Plastic materials having some of the properties of linoxin (oxidized linseed oil such as is used for the production of linoleum) are produced by forming certain aldehyde resins. For example:

Butyric aldehyde is condensed in presence of sodium hydroxide to form an artificial resin having a softening point about 100°C. 100 parts of this resin are melted with 70 parts of dioxystearic acid. The mass, which has the consistency of linoxin, is now stirred with 50 parts of lamp black, 30 parts wood flour and 10 parts ochre until uniform. The resultant plastic mass can be molded into picture frames and the like, looks like ebony and can be worked mechanically, polished, etc. By using castor oil with these resins, linoleum-like products can be made. Cork substitute, cements and even artificial leather can be made, details being contained in the specification.

Molded Fibrous Composition for Battery Boxes. E. F. Germain, U. S. P. 1,623,588; Apr. 5, 1927.

An asbestos type of product, termed "fibrous quartz" and other silica material, such as silocel is used as a filler for a bituminous molding composition comprising gilsonite, Mexican asphalt and wax. The preferred proportions are 25 parts gilsonite, 25 parts prepared asbestos fiber, 25 parts silocel, 20 parts Mexican asphalt and 5 parts wax. The patent goes into considerable details as to the precise methods employed for producing a thoroughly serviceable one-piece molded battery box.

Ornamented laminated fiber surfaces. Emil E. Novotny and Charles J. Romieux, assignors to John S. Stokes; U. S. P. 1,597,538; 1,597,539; Aug. 24, 1926.

Relates to methods (1) of compositing laminated fiber structures in which a thin sheet of Durite- impregnated real wood veneer is composited to a fiber backing and an impregnated base body. (2) The second patent relates to a method of covering the first structure with a thin sheet of transparentized tissue paper, also impregnated with the Durite, and finally pressing the structure to get a highly polished surface. Imitation wood panels are thus made. The Durite referred to is a phenol-furfural resin.

Preparation of phenol resins. Carl Kulas and Curt Pauling, U. S. P. 1,609.367; Dec. 7, 1926.

A process for producing phenolaldehyde resinous condensation products which comprises condensing together methylene phenols and phenol alcohols which consists in preparing a methylene-diphenol mixture by the action of an acid on phenol and formaldehyde and in resinfying it together with phenol alcohols, produced by the action of a basic condensing agent upon an additional mixture of phenol and formaldehyde, completing the reaction by boiling, dehydrating, and converting the thus obtained soluble initial condensation product into the intermediate product by heating.

Machine for Manipulating Plastic Materials. William A. Gordon, U. S. P. 1,608,980; Nov. 30, 1926.

A machine for manipulating plastic materials comprising a rotatable shaft, a worm rotatable with the shaft for breaking up, feeding forward and masticating the material delivered thereto, a housing surrounding the worm and having an opening to the interior near the receiving end of the worm, a head attached to the housing and containing a conical kneading chamber having a fluted wall in continuation of the housing chamber at the delivery end of the worm, and an orificed die attached to said head.

Surfacing-Material containing casein. Carlisle K. Roos, assignor to United States Gypsum Co., U. S. P. 1,606,722; Nov. 9, 1926.

A surfacing material suitable for covering walls, etc., and especially for use over wall-board joints, may consist of casein 12 parts, borax 2 parts, finely ground asbestos fiber 40 to 50 parts, finely ground anhydrite (calcium sulfate) 20 to 25 parts, lithopone 15 to 20 parts, hydrated dolomitic lime 5 parts.

Synthetic resin from coal tar oils, formaldehyde and acetone. C. O. Terwilliger, U. S. P. 1,624,082; and 1,624,638; April 12, 1927.

Coal tar oils boiling between 224° and 300°C are condensed simultaneously with an aldehyde such as formaldehyde (or hexamethylenetetramine) and a ketone such as acetone, in presence of alkaline catalysts. Acetone oil may be used in place of acetone.

Forming articles from comminuted materials. Hillhouse Buel, U. S. P. 1,624,471; April 12, 1927.

Comminuted material, the nature of which is not stated is forced against a foraminous mold which has no core, under greater than atmospheric pressure, a partial vacuum being maintained outside of the mold; and heated gaseous fluid is passed through the material to further compact the same. (The application was filed in 1917).

Cold-molding plastic composition. Clarence A. Nash, assignor to Cutler-Hammer Mfg. Co., U. S. P. 1,596,760; Aug. 17, 1926.

A patent 1,233,416; 1917, to W. H. Steinberg, is referred to for a composition comprising an inert base or filler, a polymerizing or vulcanizing agent and a binder including coal tar pitch, stearine pitch, an animal or vegetable oil capable of polymerization and a high boiling solvent; the present patent constituting an improvement upon the one just cited.

According to this invention, some asphaltic body, as gilsonite, glance-pitch, manjak, grahamite or the like, is substituted for the coal tar pitch of the earlier composition. A typical mixture is stearine pitch 400 lbs.,

(50%), coal tar pitch 280 lbs., (35%), gilsonite 120 lbs., (15%), castor oil 64 lbs., (approx. 10% of the foregoing after deduction for loss of precipitated carbon); benzol 200 lbs., paraffin oil (1 to 10% by weight). A molding compound may contain 150 lbs. of disintegrated asbestos with from 37 to 40 lbs. of such a binder as just described, and with 9 lbs. of a vulcanizing agent such as sulfur. The material is molded cold and the pieces then heated to not over 550°F for from 10 to 24 hrs. Molding pressures run from 5,000 to 15,000 lbs. per square inch. Other fillers than asbestos can be used.

Molding cellular rubber loud-speaker horns, etc. Richard T. Griffiths, assignor to Miller Rubber Co., U. S. P. 1,613,993; Jan. 11, 1927.

The essential feature is the use of an internal metallic reinforcing sleever which acts somewhat as a core, and which remains permanently in the finished molded horn, acting as a reinforcement.

Making phenol resin varnish. Louis M. Rossi, assignor to Bakelite Corporation, U. S. P. 1,613,724; Jan. 11, 1927.

Aqueous solutions of phenol resin varnishes, especially for use in coating and impregnating paper and fabrics for eventual manufacture of laminated products is produced by treating 1 kg. phenol, 0.9 kg. formaldehyde and 0.03 kg. sodium hydroxide for 30 minutes at boiling temperature, then adding 0.38 kg. powdered rosin, boiling till homogeneous and then adding 0.091 kg. hexamethylenetetramine. A water solution of phenol resin suitable for the purpose results. The rosin is claimed to lessen the reactivity of the resin.

Sound Record. Frank L. Dyer, Montclair, N. J., U. S. P. 1,628,658; May 17, 1927; Application May 7, 1923.

The present sound record differs from the earlier types by having the sound grooves very much smaller, materially less than 0.005 inch in width, and the method of reproduction involves rotating the record at a speed of materially less than 40 inches per minute. This makes it possible to produce a single record that will run about one hour. The sound is either picked up with a stethoscope, or, preferably, is amplified by an audio amplifier as in radio receivers. The molding etc., is done in the regular manner. As this permits of the reproduction of entire acts of plays, long musical compositions, etc., it should prove a valuable addition to this art.

Natural resins combined with synthetic resins. August Amann and Ewald Fonrobert, Wiesbaden, Germany; assignors to Chemische Fabriken Dr. Kurt Albert, G. m. b. H., of Amoneburg, Germany. U. S. P., 1,623,901; April 5, 1927; application February 4, 1924, (Germany, August 18, 1917).

This patent quite evidently covers some of the processes employed in making the now well known "Albertol" resins, and especially those soluble in oils, and hence applicable as substitutes for the expensive fossil resins used in making varnishes. Broadly the process consists in re-

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3. The ejection stroke of the bottom dies is equal to the stroke of the main ram. This long stroke makes it possible to mold deep pieces and eject them without sacrificing any of the press opening.

4. The elimination of top ejector tension rods passing through the top head and bottom platen increases the space available for dies.

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acting upon natural resins, for example rosin, with the reaction product of a phenol and a carbonyl compound such as formaldehyde, acetaldehyde, etc., and then esterifying the product with a polyhydric alcohol such as glycerol.

Molding Press for making one-piece containers. Harold M. Sturgeon, Erie, Pa., U. S. P., 1,623,022; Mar. 29, 1927; application filed Feb. 18, 1926.

Constructional details and method of operation of a press suitable for making battery boxes and the like. Claim 1. In a molding press for containers, a mold case, mold-box plates in said case, means to impart vertical movement to said mold-box plates with relation to said mold case, fluid actuated mechanism to press down upon the upper edges of said mold-box plates, a core-mold, and fluid actuated mechanism adapted to force said core-mold into said mold-box and withdraw it therefrom in opposition to the first mentioned fluid actuated mechanism.

Sound Record. Frank C. Hinckley, Stratford, Conn., assignor to Columbia Phonograph Co., Bridgeport, Conn., U. S. P., 1,625,705; Apr. 19, 1927; Application filed May 29, 1924.

Means are described for making a record which will not produce the scratching noise caused by the musicless ends and beginnings of the sound grooves. Covers, among other things, "a phonograph record having a terminal circle provided with a substantially vertical inner wall and a sloping outer wall, and having a high-pitch cross-over groove gradually decreasing in depth and entering the circle near the upper edge of the sloping wall."

Coloring Synthetic Resins Black by means of Furfural. John P. Trickey, Evanston, Ill., assignor to the Quaker Oats Co., Chicago, Ill., U. S. P., 1,627,939; May 10, 1927; application filed Jan. 2, 1923; renewed March 23, 1927.

Finding that furfural when heated in the presence of a small amount of an acid would be transformed into a black substance of considerable strength, the inventor applies this reaction for blackening wood, molded resins, etc. The process comprises treating the molding material with furfural, rendering such material slightly acid, and then subjecting the material to the action of heat thereby causing the furfural independently to react *in situ* to impart the black coloring action.

Algin Compounds and Products. Bernard F. Erdahl, Duluth, Minn. U. S. P. 1,625,301; Apr. 19, 1927.

Alginic acid (which may be used as a binder in plastics, see PLASTICS for April, 1927, p. 166) can be rendered instantly soluble in such dispersing agents as ammonia by ageing the precipitated alginic acid in a weak acid bath. The solution of such alginic acid in ammonia, forming ammonium alginate, is employed in the impregnation of wood pulp, paper, etc., including asbestos and other fillers, which may then be worked up into plastics, insulation, etc.

Brake Linings

(*Continued from Page 471*).

carding cylinder , previously mentioned, is fed. The fibers are deposited thereby in a thin layer on a moving belt.

The resin or other powdered impregnating material will adhere to the outer surfaces of the fibers and the layer of material thus covered is then preferably folded upon itself several times with the impregnating material between the folds.

When a sufficient number of folds of the fibrous material have been made such as the three folds, the material is removed to apparatus for twisting the same to form something in the nature of yarn.

The yarn is subsequently woven into a fabric, carrying the impregnating material distributed throughout the body of the same.

Use Hydraulic Press

The sheet or tape material in suitable lengths may then be subjected to heat and pressure, and in the case of fabric which has been treated with a phenolic condensation product, is placed in a hydraulic press in which it is subjected to heat and pressure sufficient to cause the final hardening reaction of the phenolic condensation product. The first result of the heat treatment is to melt the condensation product which will thereupon flow to greater or less extent through the body of the fabric without, however, losing any of its uniformity of distribution.

Different properties may be imparted to the fabric by different manipulations of the hydraulic press. Thus, it may be subjected to more or less preliminary heating in the press before pressure is applied. The coefficient of friction of the finished product may be altered as desired by such treatment. The density of the final product will vary in accordance with the length of preliminary heating

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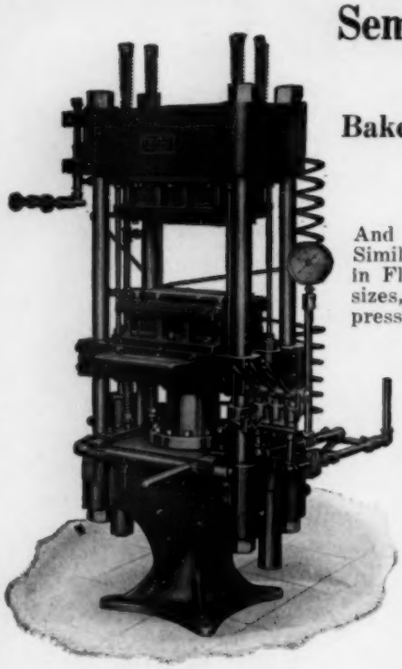

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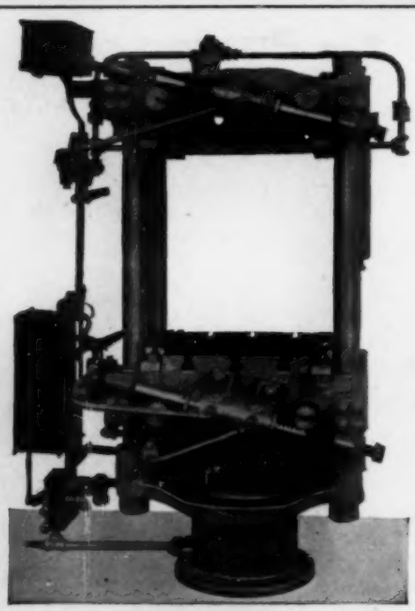

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which is followed by the simultaneous application of heat and pressure, as is well known. Various manipulations of the character described will give the product varying abilities to withstand wear and varying coefficients of friction and the preliminary treatment will be governed by the desirability of obtaining greater resistance to wear or greater coefficients of friction in the various cases.

An Ideal Lining

An ideal brake lining may be considered as one having a high coefficient of friction with a thermal conductivity equal to that of the metal of the brake drum with which the brake lining is to be used. It may, therefore in some cases, be desirable to bring up the thermal conductivity of the brake lining to a higher point than it would have by practicing the process which has been described. This may be accomplished by depositing a suitable proportion of a powdered metal together with the phenol resin, upon the fibrous layer which is subsequently folded and twisted as described. Powdered aluminium is considered a desirable metal for this purpose. Other powdered materials can also be deposited upon the batting or fibrous layer if desired, where special properties are found desirable and practical.

Graphite Added for Smooth Braking Action

Thus, for example, in certain cases, powdered graphite may be added to the powdered phenol resin which is deposited in the batting so as to make the braking action of the brake more smooth, this being desirable in certain cases only. It should be understood that the invention is not limited strictly to the details of construction and steps of process which have been specifically described, but that the invention is of a considerable breadth.

The patent also gives considerable minute detail as to operating conditions and formulas for compositions.

Peat Plastics

(*Continued from Page 456*).

and shade effect), while the cost of these products is very low as a result of the cheapness of the raw materials and the inexpensive method of manufacture.

The art-decorative products obtained in this way may be used as a covering for walls, floors and ceilings, or for the manufacture of objects of art, etc.

The process is carried out in the following manner.

The pieces of bog deposit or peat are cut in sizes ranging from 8 to 8000 cubic centimetres and then are dried either by natural or artificial means until the water content is 10% or less. The dried pieces are then introduced into the press without the addition of any binding or other substance so that the fibres extend in various directions and interfere with one another. The material is then pressed into the desired shape at a temperature of 40-200° C. and a pressure of 25-300 atmospheres.

The pressure is dependent on the purpose for which it is desired to employ the pressed material.

Zyl Frames

(*Continued from Page 458*).

otherwise treated. He also makes ingenious use of the centers of eyeglass frames that have been cut from sheet stock.

As will be seen from the illustrations, taken from his patent, fig. 1 shows a blank frame, from which a disc-like piece 14 (Fig. 2) is cut. This, otherwise waste, piece of material is utilized by the inventor to form a flat spiral, as shown in his Fig. 3, and this is made by cutting the disc 14. This spiral is then rounded out as in Fig. 4, and is grooved to hold the lens. This straightened spiral is then inserted into the frame itself, and by reason of its inherent tendency to return to the spiral shape, will clasp the lens firmly.

A pleasing tendency in all of the patents reviewed herein, is

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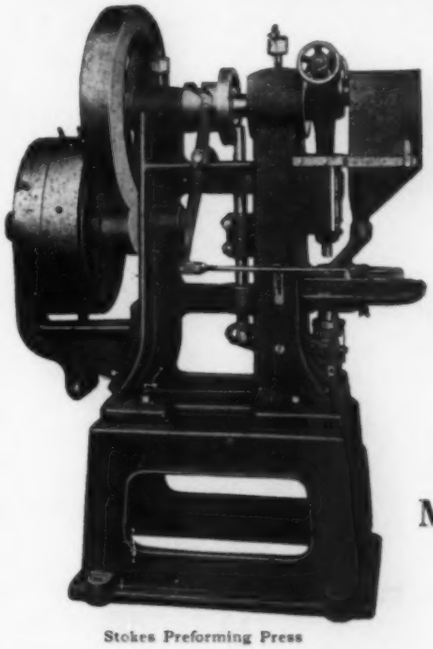

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Pyroxylin Plastic Cellulose Acetate and Other Non-Inflammable Materials

the premises of the inventors to call the pyroxylin material **Zyl.** As we have often said, here is a good word to adopt for pyroxylin plastics in general, and, as far as PLASTICS is concerned, it shall become our favored designation when referring to pyroxylin plastics generally.

Furfuraniline

(*Continued from Page 459*).

been assigned to the American Insulator Corporation. The inventor further describes his process, and particularly the use of furfuraniline by stating that he has discovered that "furfur-aniline as the above product is called, is especially valuable as a hardening agent for fusible resinous products prepared from phenols and aldehydes. For example, a solution in suitable solvents of a fusible phenol-formaldehyde resin to which has been added a requisite quantity of furfur-aniline may be used as a binder for cold compositions or it may be employed as a varnish or enamel for coating or impregnating. Heating to a temperature in the neighborhood of 150° C. for a period of several hours forms a hard, tough, insoluble and thermo-rigid product.

Advantages

The use of furfur-aniline as a hardening agent for resins has distinct advantages, as it is relatively non-volatile at atmospheric temperature, and comparatively free from objectionable odors. Incorporated with the resin, it may be kept for a prolonged period without deteriorating, and may be heated to a temperature not exceeding 90-100° C. without harmful effects. The final product after baking is a lustrous black resin.

The proportion of furfur-aniline required ranges upward to 90 parts by weight to 100 parts of fusible resin, but large proportions of furfur-aniline tend to make the final product brittle and weak. The resinous furfur-aniline as employed for the purposes of this invention is

readily soluble in benzol, a mixture of alcohol and benzol, and in the resin.

In the preparation of cold molding compositions or for other uses, various solvents of high boiling point such as certain coal tar distillates or their hydrogenated or chlorinated derivatives may be added. Notable among these are naphtha, hydrocarbon oils, naphthalene, chlornaphthalenes, and hydronaphthalenes, oils, waxes, or other modifying agents. Fillers such as asbestos, wood flour, mica, china clay, slate, talc, asbestine or other inert substances may be employed, and coloring matters may be used in certain cases, such as carbon black, dyes, etc.

Method of Use

In practicing the invention, the fusible resinous product is first formed from phenols and aldehydes in the usual manner. It is then placed in solution in a suitable solvent and furfur-aniline added thereto. The furfuraniline may be added in varying proportions upward to 90 parts by weight to 100 parts by weight of fusible resin. The mixture may be heated to a temperature of substantially 150° C. for a period of several hours to form a hard, tough, insoluble and thermo-rigid product.

"Latex Molded"

(*Continued from Page 466*).

be varied and more rubber used in some instances as desired.

Cold molding may be accomplished by omitting the catalyst from the above formula and moistening the proper material with a small amount of organic solvent containing a catalyst in solution. For cold curing, a condensation product of carbon bisulphide, such as tetra methyl thiuram disulphide, etc., may be employed and the cold curing proceeded with in the ordinary manner. The material in either event, after being dried, has the form of a dry, flaky powder readily handled and easily molded.

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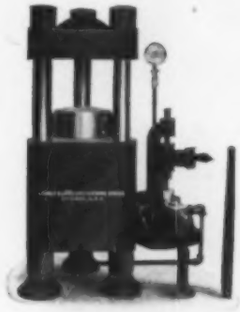

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Most Important Factors of Impression

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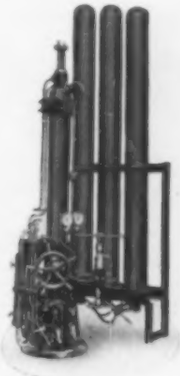

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TOOLS, DIES & MOLDS

World Plastics Trade

(*Continued on page 461*)

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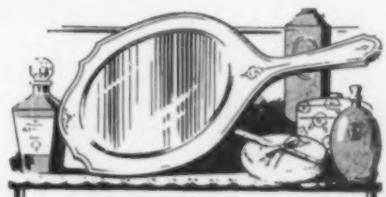

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Vol. 1 SEPTEMBER, 1927 No. 5

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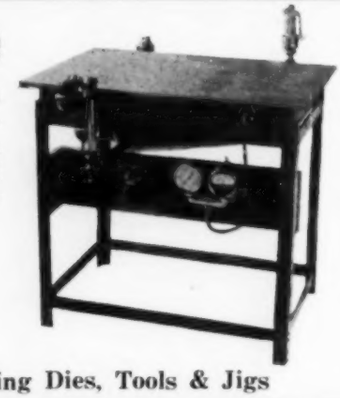

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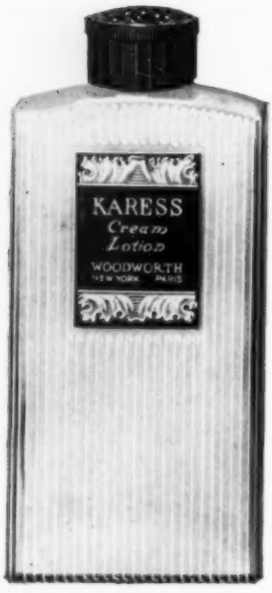


Bottle top of molded phenol resinoid. (Photo courtesy Woodworth Inc., New York).

Stamped from brass, a bottle cap must consist of two parts, the outer part being needed to conceal the unsightly screw thread on the inner. Molded from resinoid, however, a one-part cap will suffice. The screw thread molded in, is not visible on the outside-another consideration making for success in mass production.

Somewhat similar considerations apply to the use of phenol resinoid for collapsible tube tops, a use already noted in these columns (Molded Products, May, page 247). Another such application should be sprinkler tops for liquids, while phenol resinoid screw stoppers for glass bottles are already in use.

There is one point not to be overlooked in the use of plastic materials for large containers for cold cream and the like—the aspect of permanency. For receptacles to be kept when empty, their beauty and comparative unbreakability are of the utmost value. This might be emphasized as an important selling point.

Featuring the Molded Compact

One maker of book compacts (Terri) makes much of the fact that a phenol resinoid is used for his product in a publicity campaign, as colorful as it is extensive, carried out to interest both distributor and user. That color is a factor potent to increase sales is vouched for by this statement "—in a test conducted in a New York store, *the colored cases outsold the black Book Compacts several times over!*"

To quote further from this publicity on behalf of the "paragon of compacts," "The polished Bakelite in which they are made, too, is quite a relief after the interminable array of gold and silver plate that has been haunting the shops."

Wear will not mar their polished surface nor will there be any denting in use. Further, unlike metal, in wintry weather they will not be chill to the touch, nor glare in the sun.

A molded compact which is colorful, lasting and different. (Illustration courtesy Terri, New York)

The cases we have cited should not stand alone. There must be numerous similar instances where lightness, unbreakability, inertness to chemical and solvent action and, above all, color should be of unique value.

Molded Electrical Insulation

IV.—A discussion of its safety services, oil resistance and toughness

By Dr. Ing. *Sommerfeld*

IN a further discussion of the points raised by Dr. Sommerfeld in his interesting lecture on molded insulation as produced in Europe, a Mr. Jung contributed the following remarks:

That of the four protective measures employed in guarding insulated pieces or such objects as must not show any potential, namely neutralization, grounding, protective boxes and insulation, insulation was the one least used. The main reasons were that it was expensive, and especially in Europe following the war, was of poor quality, as Europe did not possess a sufficiency of suitable raw materials, and as furthermore many new plants had taken up the manufacture of such molded insulation without proper technical advice or experience.

Safe Switch Boxes

Since the various German molders had combined, great progress had been made in this field. At least two German concerns are furnishing switches etc. in housings made of insulating material instead of the usual iron boxes, and this move is applauded by the distributors of electric current, as it makes for greater safety. Objections raised in some quarters against the cost of such boxes are well answered by the simplified construction possible in the switch-boxes themselves and the greater guarantee against accident, besides the saving in grounding cables etc.

At the forthcoming "Werkstoffschau" (Raw Materials Show), in Germany, the firms

(*Continued on page 499*)

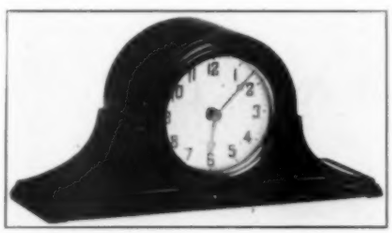
Improving Office Equipment

Uniquely meeting the requirements of modern office equipment, parts made of plastic materials are being universally used to ensure efficiency and to promote saleability

By A. Moses

THIS is an age of mechanism and speed. In keeping with the spirit of the times, modern business continues to enlist the aid of the machine at every turn. Less and less does the personal element dominate its countless recurring details.

In point of celerity and clarity, the modern typewriter can compete successfully with the most nimble and legible scribe. Adding and computing machines contrive to make error a difficulty. With the rise of instruments of the *genus dictaphone* even stenography may find itself in the limbo of forgotten arts.



Office clock with case molded in one operation from phenol resinoid.

Enough has been said to foreshadow modern tendencies. What of the molded part in these developments? Not only do new appliances bristle with them, but to keep keyed up to efficiency, established equipment is resorting to them more and more.

Many and Various

A casual glance at an average executive desk may be a revelation in composition materials. It should serve to emphasize the extent of this field of usefulness. The desk itself, if of the built-up kind, may be bound with strips of laminated phenol resinoid. On it may stand a beautiful desk easel of pyroxylin plastic with a pearl overlay. Desk phone, clock and writing set all owe much of their beauty and utility to plastic materials. If its occupant is a devotee of My Lady Nicotine, there may be an ash tray, smoker's set and cigar lighter, each a silent salesman for the molded part. And so the list might continue . . . .

Apart from a lowered cost, the direct result of the simplification and uniformity inherent in the molding process itself, there are a number of requirements to be met in this sphere. First there is ability to stand up to the proverbial rough usage of office routine. Next there is lightness in weight to permit of portability and ease of operating. Then come pleasing appearance, cleanliness and resistance to the acids of ink and perspiration. In fine, suitably chosen molded parts can fill these requirements to the hilt, and their incorporation cannot but promote the sale of the complete product.

Iron and Brass Replaced

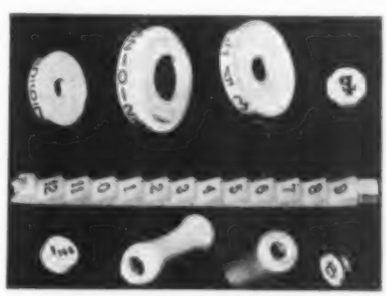
Strength in metal is one of its undoubted characteristics. Yet parts molded of phenol resinoid have successfully replaced metal. In this connection, one recalls the molded side panels of the Egry register with their numerous metal inserts. Replacing the cast iron in the earlier models, the use of Bakelite meant fewer operations and more uniformity in manufacture, and portability and permanent polish in use.

A further instance is the new Ediphone's speaking tube. As a nickel-plated brass tube it was uncomfortable to handle in cold weather, subject to the action of the acids of perspiration and likely to suffer denting in service. Now, molded from phenol resinoid, these drawbacks have disappeared. Lustrous when it leaves the mold, its polished surface needs no upkeep.

Pyroxylin's Quota

As a substitute for wood, Celluloid very early made its bow on numerous keyboards, and its keys continue to grace such nationally-known machines as the Monroe, Burroughs, Dalton and Marchant. Being pliable, such pyroxylin plastic keys can be press-fitted without fear of breakage. In serried rows of contrasting color they assist the operator and provide fittings at once durable, resistant to handling and to shock.

The light weight of pyroxylin plastic register and numeral wheels enables them to "throw over" easily when registering totals in adding and calculating machines. Their depressed characters are permanently and easily legible. Lastly their intricacy of form marks them out as ideal for the molding process.

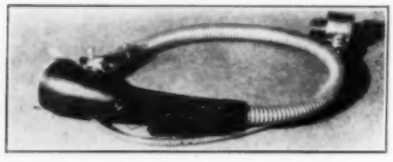


A selection of pyroxylin plastic parts used on office machinery.
(Photo from articles supplied by Celluloid Corporation)

The Elliot-Fisher accounting machine has seven Bakelite parts, some so replete with recesses, holes and channels that molding them is the one feasible process.

On the Peters Adding

machine several parts have to bear the brunt of constant and often severe handling. It is just these, comprising platen knobs, push buttons, touch bar and handle that are molded of the phenol resinoid.



The new Ediphone's speaking-tube; once nickel-plated brass, now a molded part.

Similarly, Remington regards the molded component as a very desirable feature on office, portable and electrically-operated models. On the portable instrument it is the platen-knob made in one operation, rim knurled and steel hub embedded; on an electric model, the terminal block and cover, channelled, drilled and three metal fittings inserted.

Concurrently with the growing use of the molded phenol resinoids for office equipment, the laminated products have been responsible for many developments. Silent-running office fans with Micarta blades have already been noted (June 1927, page 304). Because they do not warp, these materials have been made into rulers and straight edges. Further their attractiveness and resistance to wear have led to their use for the book binder covers of the Brooks "Visualiser." Considations of long wear also determined the use of the laminated product for the clutch faces and brake on the Line-a-Time note book holder.

Wood Improved Upon

Wood for long held an entrenched position for the handles of such labor-saving devices as numbering and stamp-affixing machines. The Multipost Company departed from the usual practice and substituted a part of richly mottled Bakelite for its handle of enamelled wood. By so doing, the polish became lasting, and the process of squaring the round fitting hole was dispensed with. As noted in a recent issue (May 1927, page 247), the Bates Mfg. Co. are also replacing the wooden handles of their numbering machines with molded parts.

This is no place to enlarge on the use of the pyroxylin plastics and the transparent forms of the resinoids for such perquisites as desk sets, pencils and pens. For their ubiquity is evidence enough of their popularity. A point which does need emphasis, however, is their resistance to the acids of ink.

Concluding, it would seem that only the mechanical problems of mold construction and a certain small shrinkage on molding can set a limit to development. For it requires no unusual perspicacity to see what developments are possible because of the great strength of the plastic materials and their lightness in weight.

The Molded Aircraft Propeller--

a part subject to intense strains and violent natural forces

ONE can safely say that next to the engine itself, the success of even a short aerial flight depends upon the propeller. In fact the combination of the two is often referred to as the power unit. For the propeller, by applying to the air the torque induced by the engine, makes aerial cruising possible.

Disruptive Forces at Work

The modern aero engine can develop anything up to 1,000 horsepower, an intense concentration of power approaching that of the locomotive. For its transmission, larger and larger propellers must be developed, rotating at unheard of velocities. The centrifugal force at any point in the propeller blade depends upon the square of the velocity at that point. So that, the disruptive tendency at work in the modern propeller can be readily realized.

In front, a Bakelite-Micarta propeller; behind, the U. S. Army plane flown to Hawaii by Lieutenants Maitland and Hegenberger on which three of these were used.

Minimum Density Essential

Besides ability to withstand the strains induced by rapid rotation and vibration, the maximum lightness is essential. Propellers of the aluminum alloy duralumin have been used in an effort to combine these requirements. But the phenol resinoids are lighter than these alloys, and, moreover, have the requisite strength.

In actual flying, there is no more exposed member than the propeller. Not only is it liable to the sudden changes in the

(*Continued on page 498*)

A Good Drive for Business

By Van Sylman

No. 3. Adventures of Tom Tompkins, Salesman for the Super Mold Corporation

WITH a pleasant sigh, Tompkins closed his desk, reached for his hat and stick and left the office.

"Another week over, and it wasn't a bad one at that," he thought. "Well, no more business till Monday. Now for some golf."

He drove out to the club and hurried into his togs, for he was to meet two other players at the first tee. When he arrived, they introduced him to a Mr. William A. Chester who was to be his partner in the foursome.

Tompkins noticed that Chester was a rather imposing individual, but he did not let his curiosity get the better of him. He concentrated on his game, and with good results, for through his efforts he and his partner won eight out of the first nine holes.

Between Shots

They were resting and waiting at the short tenth hole when Mr. Chester in high good humor asked, "What business are you in, Tompkins?"

"Molded products" was the answer. "What business are you in?"

"Shaving," laughed Chester, "Or, to be more exact, safety razors." Tompkins now mentally connected him with the newest idea in razors that had been so unusually successful.

They got up to drive and after two good shots, they walked down the fairway together.

"Just what do you mean by molded products" asked Mr. Chester.

Tompkins Explains

Tompkins went into as long an explanation of his business as the occasion would let him.

A few more holes had been played when Mr. Chester amiably said "Too bad we can't use your stuff in our business. I'd like to turn something your way."

Nothing more was said till they were in the locker room when Tompkins opened up. "How do you know you can't use a molded part in your product? Now, I don't want to be presumptuous or tell you how to make safety razors, but I feel certain that you or your organization have not looked into the possibilities of improving your razors with a composition part."

"You don't mean to tell me" smiled Chester, "that our razors would cut better if the blades were molded, do you?"

"No, I don't. As a matter of fact, I don't know just where or how our stuff would fit into your accessory. But I will tell you what I would like to do. Let me go down to your plant next week, look carefully over your processes and finished product, and if I think I see a way to make them better, I'll tell you so. If I don't, I won't have a word to say."

"Fair enough. Go down and tell Harrison, our superintendent, that I said you were coming in to save us thousands of dollars and to let you look over anything you want."

Naturally, early the following week, Tompkins carefully and painstakingly went over every detail of the manufacturing and sale of the Chester razor. He even used one; and he made some investigations which were not included in the ordinary search. In ten days, he had his report ready, sent in his name to the president and was admitted to the important interview.

Razors and Molding

"Well, Mr. Chester, I find the Chester razor the best I ever used and your manufacturing methods about the most efficient in my experience".

"Thanks" ironically said the reason for all this. "I suppose, then, you will admit I was right when I said we couldn't use molded products in our business?"

"No, I won't admit anything of the kind, and I'll tell you why. I not only went through your

(*Continued on page 501*)

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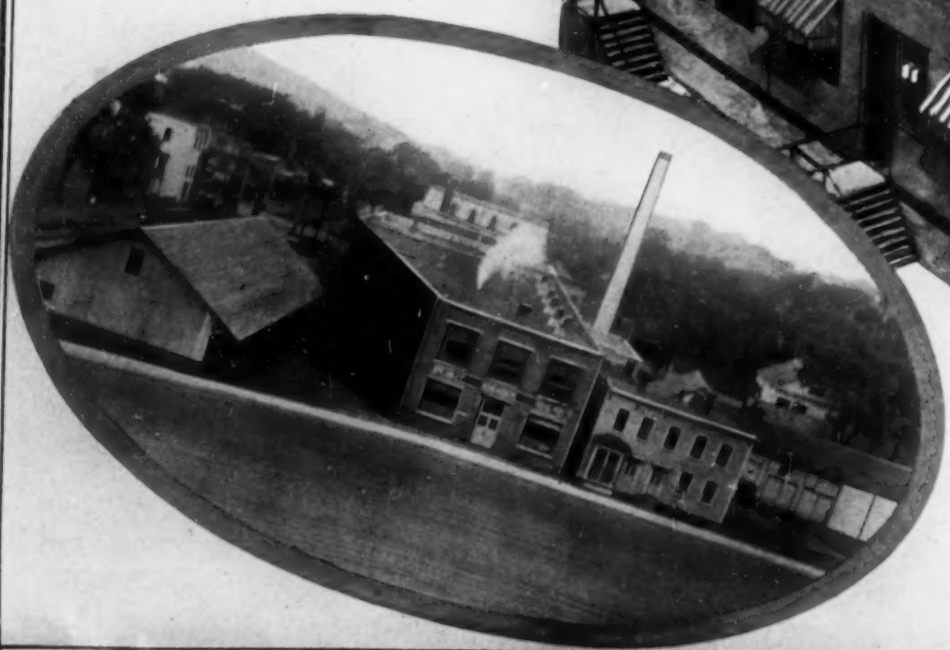

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Hot Molding Vs. Cold Molding

A lucid discussion of the pros and cons in choosing between the two classes of products

By W. F. Lent

Asst. Supt. Cutler-Hammer Mfg. Co.

FOR the prospective user of molded parts, the choice of material is influenced by a number of factors. The line of demarcation is usually quite clear. On the other hand these factors are sometimes so finely distinguished that it is difficult to give a rigorous demonstration of the superiority of a given material. Indeed, in some cases, a part, if properly designed, may be made as well of one material as of another. This discussion is for the purpose of analyzing the main factors in this choice of materials.

The materials available for plastic molding fall broadly into two classes—cold molding and hot molding. In the first process, the heat necessary for the curing of the parts is applied subsequently to the molding operation. This is carried on at room temperature—hence the name "cold molding." In the second process, heat is applied to the mold during pressing—hence the name "hot molding."

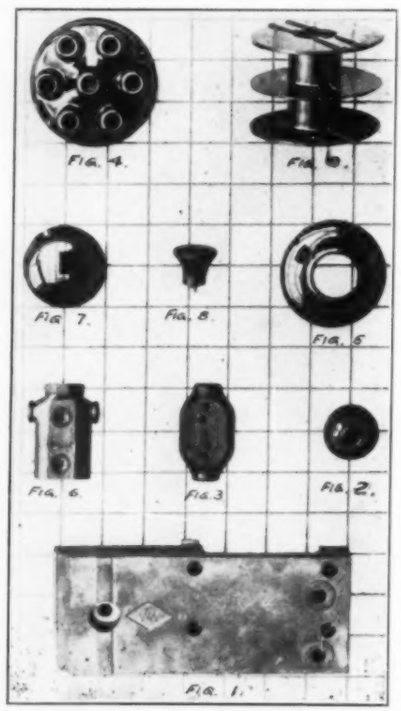
Four Classes of Composition

The writer's previous article, (PLASTICS, 1926, 117) described the cold molding process. To save duplication the reader is referred to this article for details. Suffice it to say that the organic materials generally have for a foundation a mixture of natural pitches or asphalts and oils used as a binder for more or less finely divided asbestos. In the cold molding trade the compounds are made up to special formulae by the individual manufacturer solely for his own use in molding.

The most familiar hot molding materials are:—

1. — Condensation products. These are made with a binder of a synthetic resin of the type of phenol condensed with an aldehyde. The filler is wood flour or finely divided asbestos.

2.—The so called "Shellac" or "Button Stock" compounds. These use a binder of various proportions of shellac, copal and rosin and a filler of wood flour or cotton flock. On account of the low heat resistance of these compounds their use has been pretty generally limited to phonograph records, apparel buttons, novelties and buttons and knobs for electrical devices. They have the advantages of low material and fabricating costs and a good appearance.



An assortment of molded parts described in the article:
Figs. 1, 2, 3, 8, cold molded
Figs. 4, 5, 7, 9, hot molded
Fig. 6 made in part from each class.

3.—Rubber compounds.

When molding material of the first type is placed in a mold and heated, it first fuses and flows to all parts of the mold under pressure. In a short time the heat causes a chemical transformation, hardening the material in the mold. Continued heating will not again cause fusion.

Contrary to the conditions obtaining in the cold molding industry, these synthetic molding materials are generally purchased ready for use by the molder, so that a large number of different molding concerns may produce parts of the same material.

Comparative Merits

For the purpose of this discussion we will use condensation products of the resinoid type as representatives of hot molding in comparison with cold molding. We will bring out the most important points of comparison in the following outline, and illustrate each point with an example of an actual part, the choice of material for which was dictated chiefly by the point in question.

At present, hot-molding resinoid molding compound costs about five times cold-molding compound per pound. On account of wood flour, hot-molding material is lighter, the ratio becoming about three and a half for equal volumes and even less where equivalent results may be obtained by using a smaller volume of the stronger hot-molding materials. On the score of cost of material, the cold-molding process therefore has a decided advantage at present.

However, since the expiration

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of the fundamental patents on synthetic resins, prices have dropped to less than one-half of those prevailing a year or so ago and the end seems not yet in sight. Further process improvements and keen competition will doubtless decrease this large difference in cost in time. Fig. 1 illustrates the base of a section of a unit type of panel board made of cold-molded material. The size of this part would have made the use of hot-molded material a good deal more expensive.

Costs

The pressing operation being usually the most costly, it seems obvious that the rapid pressing in cold molding must be cheaper than the slower pressing in hot molding, delayed for the fusion and curing of the material. Cold molding is cheaper except, possibly, when very large production justifies the tool expense of a great number of die cavities, or where high polishing costs with cold molding are necessary to attain an appearance comparable to plain finished, hot molded parts. Fig. 2 illustrates the cap for a separable attachment plug made of cold-molded material. The market price established for this class of devices necessitates the lowest possible labor costs.

Mass Production

For reasonably low fabricating costs with hot molding a plurality of cavities in the mold is usually necessary. This contrasts with the familiar single cavity made possible by high pressing speeds with cold molding. The advantage in tooling costs is, therefore, very decidedly for cold molding.

In the case of the feed-through switch cover made of cold-molded material (Fig. 3), the cost of a hot molding die for orders of 100,000 is about $2000 compared with approximately $325 for a cold molding die.

Shrinkage of the compound and warpage during curing is the more pronounced in cold-molded parts. One reason for this will be obvious when it is considered that by the hot molding process the parts are held rigidly in the die during curing. Roughly speaking, the tolerances necessary for cold molding are plus or minus .005 per inch whereas for hot molding plus or minus .002 may be attained. For requirements demanding extreme accuracy, hot-molded products have a decided advantage. Fig. 4 illustrates an automobile timer cover made of hot molded material. Accuracy of fit and location of the electrodes necessitate the use of this material on practically all automobile ignition systems.

Commercial parts made of cold-molded material will probably average 4000 to 5000 transverse strength compared with from 8000 to 10,000 for hot molded. This makes it possible to reduce the amount of material in hot-molded designs. Fig. 5 shows an automobile button base made of hot-molded material. The choice of this material was made chiefly on the basis of strength.

Heat Resistance

Cold-molded material is suitable for use at temperatures up to 500°F. whereas hot-molded is suitable for 300° to 350°F. Fig. 6 shows a flatiron connector plug half of cold-molded material. High heat resistance dictated the use of cold molded material in this case.

The fusion of the material during molding imparts a dense and lustrous surface to hot-molded parts, superior to that

(*Continued on page 500*)

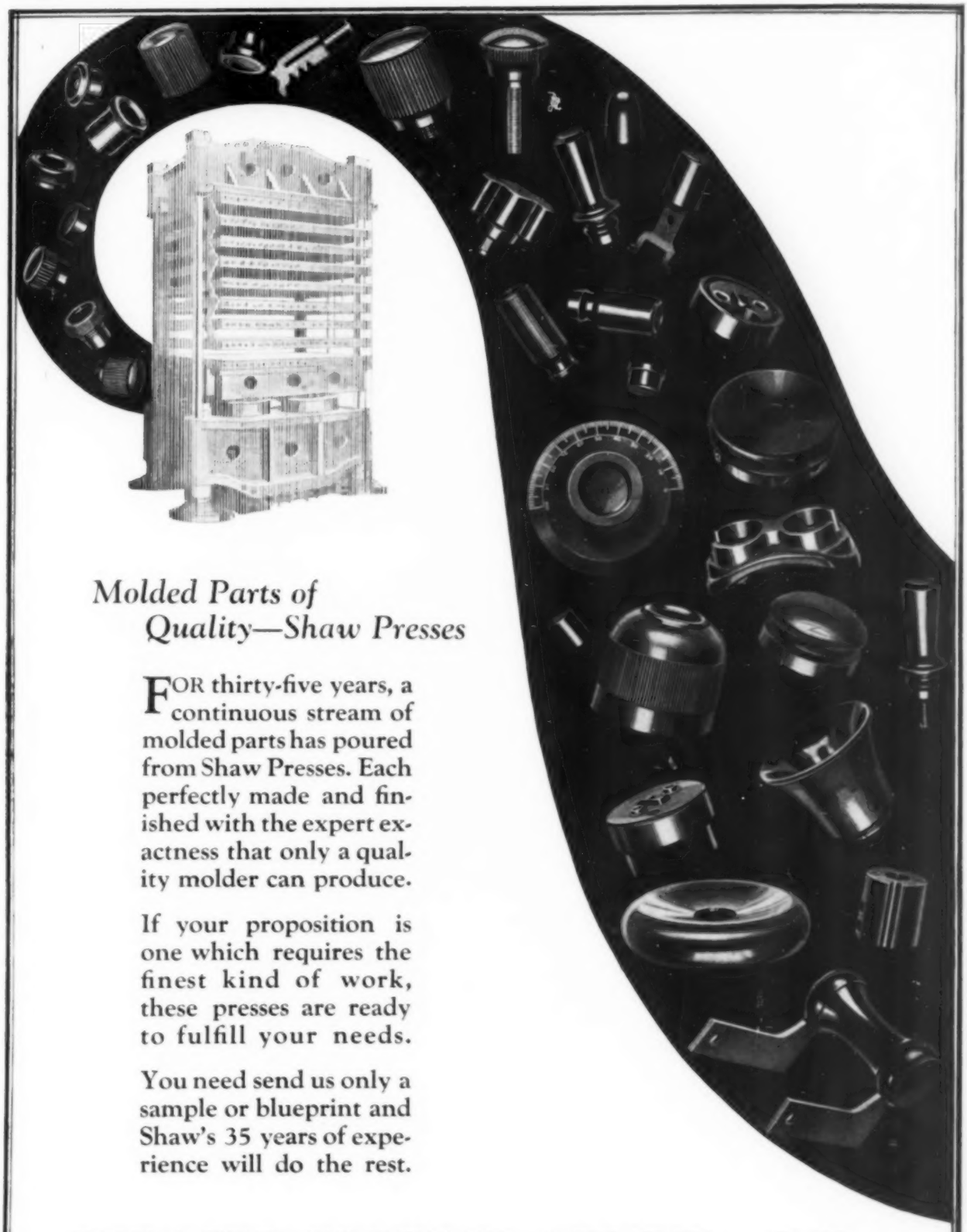
An Arresting Instrument

The policeman's whistle now a molded product

THROUGH a background of roaring traffic comes a signal piercing and clear, authority its keynote. The traffic policeman is exerting his directive powers on the vehicular maelstrom to safeguard the pedestrian seeking to cross.

So long has the metal whistle been associated with the policeman, that it came as a distinct surprise to find that it had its shortcomings. Metal may tarnish but that is not the chief drawback. Suspended at a point suitable for instant use, it necessarily takes the temperature prevailing. This is important in wintry weather, for on applying the whistle to his lips, the cold, heat conducting metal may cause soreness and even frostbite. Discomfort and even failure to operate the whistle at the psychological moment may result, with what dire consequences may be left with the reader's imagination.

Seeking to overcome these disadvantages, the Zisch Engineering Corporation, Newark, N. J. turned to molded phenol resinoid. Excluding the ring, the whistle is molded in two parts, a disc in the side being shrunk into position after the pith ball is inserted. In this way there is, very probably, a saving in cost of production. Incidentally, the whistle is another example of the replacement of metal by a molded product and it may be regarded as further evidence of the trend, "Music turns to Composition", a theme recently elaborated in these columns.



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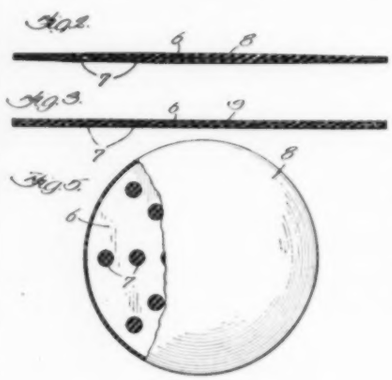

Two cross sections of the diaphragm composited of a thin iron disc and synthetic resin (figs. 2 & 3). Fig. 5 shows the method of combining the two components.

Increasing the Sensitivity of the Telephone

THE invention relates to telephones, especially of that type in which the diaphragm in the receiver or transmitter is of electromagnetic material, and is consequently responsive to the fluctuations in the magnetic field in which it is placed. Loud speakers, microphones and other instruments operating on this principle are also included.

The object of the invention is to render the diaphragm more sensitive than the types previously known. In order to avoid the effect of hysteresis, that is the lag in responding to the electromagnetic force, it is common to employ soft steel or similar metal approximately 0.10 inch thick, varnished for appearance and for protection against rust. According to the patent under review, a composite diaphragm is used composed of a much thinner sheet of metal reinforced by means of a lighter material, for example, synthetic resin.

Composite Molded Diaphragm

As the latter is resilient and much lighter than metal, the composite diaphragm vibrates much more readily than one made entirely of metal. Hence it is much more sensitive.

Figure 2 is a cross section of a diaphragm embodying the invention showing the same in lenticular form.

Figure 3 is a cross section of a diaphragm of uniform thickness.

Figure 5 is a front view of a diaphragm, a portion of the outer surface being broken away to show internal construction. The diagrams are reproduced from the actual patent specification and are numbered accordingly.

Details

Now referring to the diaphragm which constitutes the essence of the invention, a thin disc 6 is provided of soft iron or other suitable metal, the same having a number of holes 7 punched therein at various points. This disc instead of being of ordinary thickness is much thinner, for example .002 or .003 inch, although the inventor does not wish to be understood as confining himself to discs as thin as this. This metal disc is molded in plastic material 8 of a character lighter and more resilient than the metal disc. For this purpose a synthetic resin condensate is preferred in practice.

This condensate is at first plastic and the composite diaphragm is formed by moulding the disc with the condensate

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SOUVENIR—ARTISTIC LETTER OPENER

The molding is accomplished usually under heat and pressure and during the molding process the condensate will fill the apertures in the metal disc and thus produce a diaphragm which is a unitary structure, but is provided with a magnetic core.

While the inventor prefers the lenticular form shown in Figure 2—that is, a diaphragm having the form of a thin double convex lens, it is possible also to employ the flat form shown in Figure 3. In this case the condensate 9 will be of uniform thickness.

Although the metal core is shown extending to the rim of the disc, it may be of smaller diameter. For example it may be confined to the central portion, near the magnetic pieces, where the lines of magnetic force are most concentrated.

The invention is covered by U. S. Patent 1,636,410 issued July 19, 1927, to Louis T. Frederick and assigned to Fibroc Insulation Company of Valparaiso, Ind.

"Bakelite" Caravan Continues Its Tour

THIS travelling display of molded products already discribed in these columns (May, 1927, page 234) is once more on the move. Its early halting places will be as follows:

Buffalo, N. Y. Hotel Statler
Sept. 19 and 20

Toronto, Ont. Hotel King Edward
Sept. 27, 28 and 29

Rochester, N. Y. Hotel Sagamore
October 3 and 4

Syracuse, N. Y. Hotel Syracuse
October 10 and 11

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October 17 and 18

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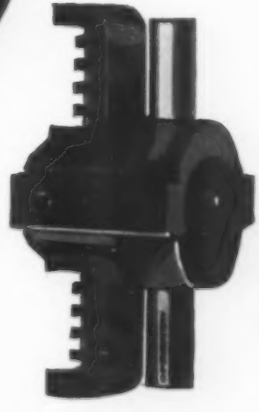

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that your whole molding job can be done here, including the stamping or machining of any type of metal inserts, thus insuring well finished parts and the most exacting accuracy.

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The Molded Aircrew

(*Continued from page 486*)

temperature due to the rapid climb, but rain and hail often pelt the whirling blades furiously. Sand and sea water, too, may add their erosive effects. To minimize the results of this elemental violence, the blades of propellors built of laminated wood are frequently protected by metal tips, while to protect their surface all kinds of coatings have been tried including Japanese lacquer. Their weight, liability to corrosion and the mechanical advantages of a laminated structure are points adversely affecting the use of metal.

To quote from Edward Schlee's account of the *Pride of Detroit's* trans-Atlantic flight to Croydon, England, (August 28)

> " . . . It (the rain) stung the whirling steel propeller with such force that it even bit into its knifelike edge as acid etches metal."

Unless its wood is seasoned with the utmost care and the finished propeller surface carefully protected from the elements, warping may set in. This may lead to serious consequences in that the balance of the propeller may be disturbed leading to an aftermath of violent vibration. Further, the grained structure of wood is a disadvantage when compared with the greater uniformity of the molded product. The strength of alloys, too, is liable to sudden changes due to the phenomenon of fatigue in metals, possibly as a result of alteration in crystalline structure during use.

Again, the unique shape of the propeller with the sweeping curve of its surfaces, offers the molding process many advantages over other building and shaping methods.

The use of laminated phenol resinoid products for propellers is not new, but the recent successful trans-oceanic flights have served to bring it into promin-

ence once again. Propellers of Bakelite-Micarta—cotton fabric layers impregnated with the phenol resinoid and then molded—have been in use on United States Army planes and on sea planes ear-marked for service on tropical waters. As indicative of their dependability and endurance, three such airscrews constructed by the Westinghouse Electric & Manufacturing Company were used on the recent army monoplane flight to Hawaii, so successfully conducted by Maitland and Hegenberger.

Molded Insulation

(*Continued from page 484*)

making the "non-rubber" molded insulating materials will exhibit articles mounted on or in such molded boxes and mountings, where grounding is not required. While there is still some competition from the rubber insulation producers, Mr. Jung suggests that it will not be long before rubber-free insulation will dominate the field.

Rubber and Resinoids

Privy Councellor Weber contributed the following:—

The artificial or synthetic, molded insulating materials are inferior to hard rubber as they are not as tough as that material, and although they are quite hard, are inclined to be somewhat brittle. He suggests that work be done to increase the toughness of the phenol resin products, and especially on means for impregnating fabrics with these materials and then molding them without making the fabrics brittle, as is now the case. An ideal solution would be an insulating material having the inert properties of Bakelite but the physical consistency of artificial leather.

Privy Counsellor Wagner says that many thanks are due the German Physikalische Technische Reichsanstalt, where Professor Scheel carried out the fundamental research upon which the classification described by Dr. Sommerfeld was based.

The lecturer, Dr. Sommerfeld, then concluded by stating that as the result of prolonged tests on molded insulating material,

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The Roto Tray Smoking Set Moulded of Bakelite by SCHNEIDER

Roto Tray—open and filled

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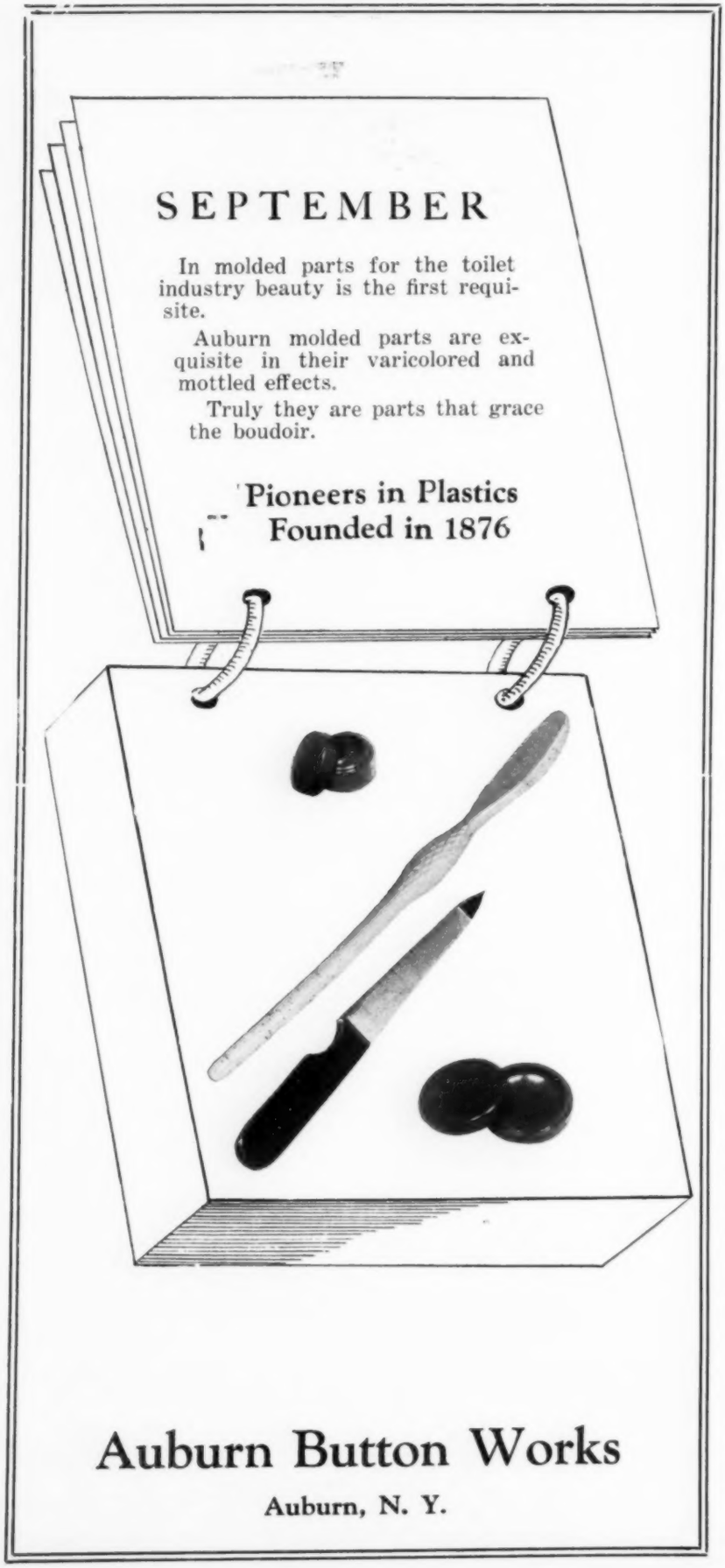
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In molded parts for the toilet industry beauty is the first requisite.
Auburn molded parts are exquisite in their varicolored and mottled effects.
Truly they are parts that grace the boudoir.
Pioneers in Plastics
Founded in 1876
Auburn Button Works
Auburn, N. Y.

carried out at 80°C, it had been found that they were highly resistant to oils. He was of the opinion that a molded material as pliable as artificial leather would hardly be suitable for anything but sheets or plates, as complicated pieces had to be stiffer; and that modern molded insulation, even when the walls were quite thin, exhibited excellent elasticity.

This is the fourth and final consecutive installment of the report of a lecture delivered by Dr. Sommerfeld before the German Society "Elektrotechnischer Verein." Previous articles dealt with the classification and testing of these important materials.

Cold and Hot Molding Compared

(Continued from page 492)

obtained in cold molding. Individual preferences usually decides on this factor. Fig. 7 shows a hot-molded knob for radio apparatus where elegance is a requirement. A knob for cooking utensil covers where extreme high polish is not necessary furnishes an example of cold molding, (Fig 8).

Intricate Forms

Sometimes particular designs are made with very thin sections and intricate form. Where these forms tend to extremes, hot-molding is pre-eminent and for a double reason. The fluid condition of the material during fusion allows remote parts of the mold to fill up under pressure, and the hot molding process is not burdened with the blistering of very thin sections during the curing stage in cold molding. Fig. 9 illustrates a hot molded coil bobbin, a design well-nigh impossible in cold-molded material.

Inserts may be molded into hot or cold molded parts with practically equal facility.

Cold molded material is suitable for voltage up to 600. For

higher voltages and when the parts must show low electrical losses under adverse atmospheric conditions, hot molded material should be used.

Conclusions

While the points brought out above do not by any means treat the subject exhaustively, they will serve to illustrate the most important considerations. They logically lead to some powerful aids to correct design. It is dangerous to generalize but at the risk of misinterpretation we submit the following:

1.—For hot-molded parts reduce the amount of material as much as possible to save material cost. For cold-molded parts add material to produce symmetrical designs to reduce warpage, aid flow of material in molding, and give adequate strength.

2.—Use cold molded parts where the minimum fabricating cost is wanted, and for relatively small orders to save high tooling costs.

3.—Use hot molded parts where the finish requirements are severe or where extreme intricacy and accuracy or great strength are required.

4.—For plain finished, cold molded parts relieve the surface by stipples, knurls, flutings or other relief designs to give an attractive appearance without polishing.

A Good Drive for Business

(*Continued from page 487*)

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"Say! We haven't done badly here," interrupted Mr. Chester.

"Of course, you haven't. But the facts are that there are still a great many men who are not using the Chester razor. Now,

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MACK MOLDING CO., Inc.

Little Falls, N. J.

some of them have told the retailers that the Chester looks like any other safety razor. We know that it has many advantages but the visual sense is a strong one and by the time the dealer displays it and starts his sales argument, the prospect says, 'Oh! All razors are about the same' and usually will not let his reason overrule his sight."

Color Injected

"Now, I propose that you use a handle and blade holder that is molded of a bright colored composition material. Let us even go further and have the container molded as well and have them both made out of the same material. You know how the vogue for color has helped to sell everything from automobiles to cigar lighters and neckties. Well, let us put these razor combinations up in a half dozen popular masculine color combinations. If you do, they will be half sold on sight and appeal to the dealer more than they ever had."

"Think of the display possibilities" broke in Mr. Chester enthusiastically. "Man, I think you may have hit on something. But how much more will it cost to do all this?"

Cost Repaid

"What do you care what it costs" and, as Chester smiled derisively, "if it increases your sales. Why the new market you will develop among gift buyers and women should absorb any additional costs."

"But frankly, I don't know yet if it will cost more. For example, you now make the handle and holder in three parts. You machine the handles, you turn the screw and cast the holder. Then they have to be finished and assembled. I believe that the whole thing can be molded at one time and in one piece. I haven't obtained your figures yet so I can't tell you the saving, if any, but I may surprise you when I am able to compare them with mine."

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Pyroxylin Plastic Playing Cards

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(*From our British Correspondent*)

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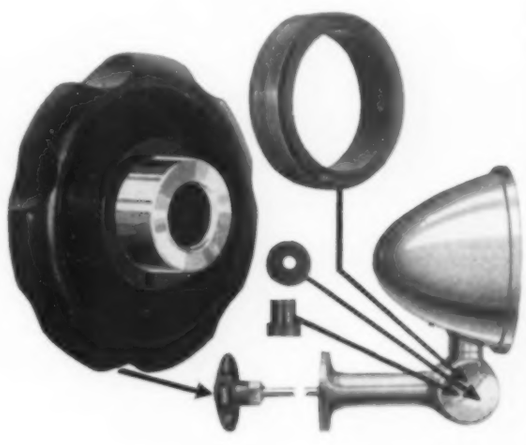

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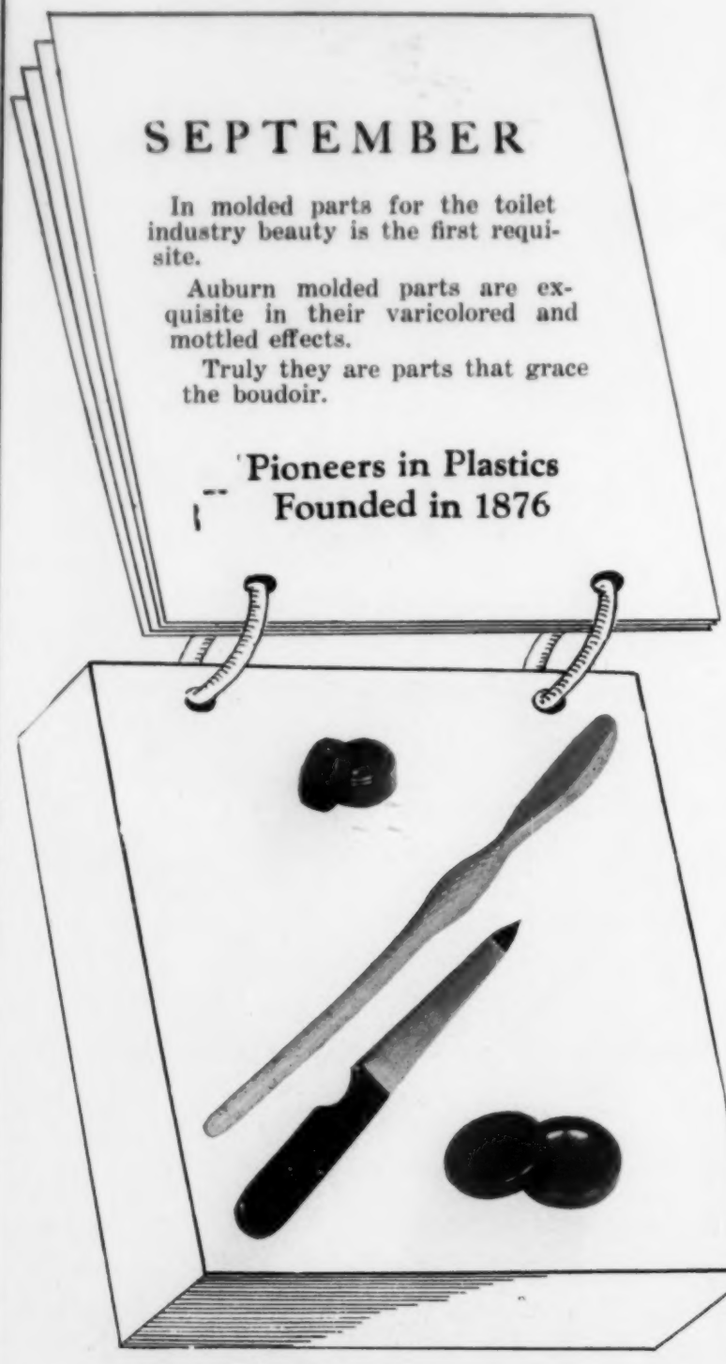
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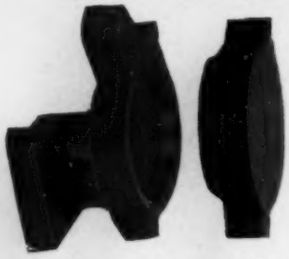

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The Manifold of Urea Resin

THE fragmentary news notes which have reached this country concerning the remarkable organic glass recently invented in Vienna and named Pollopas have aroused such interest as to lead us to secure additional details through our Viennese representative.

Pollopas is the invention of Dr. Fritz Pollak and Dr. Kurt Ripper, and its peculiar interest lies in the fact that while indistinguishable from glass in appearance, it is a synthetic organic compound formed from urea and formaldehyde.

Casting Telescope Lenses

The outstanding characteristics of Pollopas are its perfect transparency, the peculiar brilliancy of its polished surface, and its unusual strength. When it breaks it does not splinter. Its specific gravity is 1.44 or about one-half that of glass. Its refractive index varies within the limits for flint glass, namely, between 1.54 and 1.9. It is therefore hoped by the inventors that great lenses for telescopes may be cast from Pollopas to replace the very costly lenses of flint glass. In its dispersion properties Pollopas stands close to rock crystal, and it is therefore eminently adapted for the formation of optical images.

Mechanical Properties

Pollopas is, however, slightly soften that calcspar (2.95 as compared with 3). Its mechanical properties are excellent. It is readily turned, drilled, milled, filed, cut, and polished.

The new glass is highly elastic, conducts heat somewhat better than crown glass, does not melt on heating, but chars at about 200°C. It has the especially valuable property of being highly transparent to ultra-vio-

Possibilities Synthetic Glass

let light, which does not pass through ordinary glass, and it has the added advantage of being brilliantly colored by the direct dyes used on cotton.

Innumerable Applications

This unique combination of properties suggests innumerable applications of Pollopas in the field of jewelry and novelties. It lends to the production of imitations of semi-precious stones and porcelains in all colors, smokers' and travelers' requisites, billiard balls, door knobs, lamp shades, and a wide range of ornamental objects. The fact that it does not splinter would seem to make it an ideal material for automobile windshields, provided its comparative softness does not lead it to be too easily scratched and dulled.

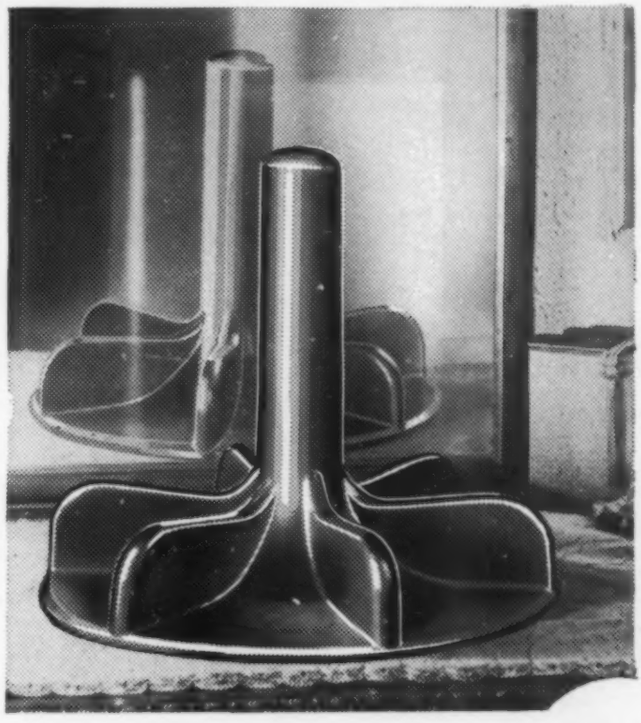
Difficulties

The present price of Pollopas is about $1.80 per pound, but as urea is now produced synthetically in constantly increasing amounts, substantial reductions in costs should be anticipated. The immediate difficulty confronting the inventors is that of producing Pollopas in large masses and in plates of the sizes required for windowpanes which shall be free from cracks and blowholes. It is their confident expectation that these troubles can be overcome within a few months.

References

The foregoing is reprinted from Industrial Bulletin Number 8 issued by Arthur D. Little, Inc., Cambridge, Mass. For further information on synthetic glass-like products see PLASTICS, 1925, 85,98; 1926, 14; 1927, 214, 324, 372.

In the August issue, the early patent on Pollopas was described together with Ostromislensky's work on Styrol glasses.



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In tool and die work of the finest finish and detail, heat-treatment and careful attention to the niceties of required accuracy our long experience is your safe-guard.

Send a sample, print or specifications. An estimate will be mailed you at once.

The quality of our work is best attested by the standing of those we serve.

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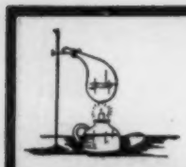

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